PRO-SPOTTER

SERVICE MANUAL
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#### R134a REFRIGERANT HOSES AND TUBING

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INTRODUCTION

This TICO Pro-Spotter service manual provides service and maintenance personnel with guidance on the proper procedures for servicing, troubleshooting, maintenance and repair of the TICO Pro-Spotter off-road and DOT/EPA on-road terminal tractors. For best performance and longer vehicle life, follow the maintenance procedures provided in this manual.

The purpose of the TICO PRO-SPOTTER SERVICE INFORMATION section is to make the reader familiar with TICO and its service resources. The following resources are found in this section:

- TICO Pro-Spotter warranty (as of January 1, 2018)
- 2018 Flat rate guideline
- TICO technical support contact information

The TICO Pro-Spotter terminal trucks have been engineered for quick and efficient servicing, while minimizing down time.

For additional information, please contact TICO factory support. (See “CONTACT TICO SUPPORT” on page 0-15.)

NOTES

- The information within this publication is current as of the time of publication. Information within this manual is subject to change at publisher’s discretion and without notification.
- TICO offers many different equipment options. Some options may not be covered within this manual. Contact your nearest TICO dealer if there are any questions.
- Do not make modifications to your tractor without written approval from TICO Manufacturing. Your vehicle has been designed and manufactured with safety and reliability in mind. Any modifications by the operator or owner could decrease the safety and reliability of your vehicle. Any unauthorized vehicle modifications may also void the TICO Manufacturing Limited Warranty. Do not risk personal safety or vehicle reliability by making unauthorized modifications to your TICO tractor. Contact TICO concerning any proposed modifications to this vehicle.

WARRANTY

[NOTE]

Warranty information provided is effective January 1, 2018. Tractors delivered prior to January 1, 2018 are subject to previous warranty terms.

For additional information, please contact TICO factory support. (See “Contact TICO Support” on page 0-15.)

TERMINAL INVESTMENT CORPORATION (hereinafter referred to as “TICO”) warrants to the original owner that each new TICO Pro-Spotter Terminal Tractor will be free from defects in material and workmanship under normal use and service for a period not to exceed 2 years or 6000 hours, whichever occurs first, from commencement of service. For 2 years or 6000 hours both parts and labor will be warranted.

TICO has developed a comprehensive warranty policy and warranty system. Our goal is to establish policies that will enable consistent, prompt and equitable processing of warranty requests.

The TICO warranty policy and system will enable our distributors to “know where they stand” in most warranty repair situations. This will enable the distributor to classify whether or not a service repair really is warrantable. The distributor can then deal with the customer more effectively. We at TICO want to make justified warranty claim a prompt, consistent and equitable experience for our mutual customers. It is vital that the warranty registration be completed via registration online and PDI completed and returned to TICO immediately following delivery of vehicle to the customer. This triggers the warranty in our system, enabling the claim to be processed. Completion of the warranty registration is also required by the National Highway Transportation Safety Administration for DOT compliant vehicles in the event contact with user is required. Please consider each claim on its own merits, remembering that this is directly proportionate to your future ability to provide a quality product at a reasonable price. We recommend that all people who deal with warranty service and administration become familiar with the procedures contained in this manual. TICO reserves the right to, at any time, change or revise the provisions of its warranty procedures, effective on or after notification of authorized distributors. All provisions of this manual are effective immediately.

PLEASE MAKE SURE THAT YOUR WARRANTY REGISTRATION AND PDI IS COMPLETED AND RETURNED TO TICO.
Introduction

I. DETERMINATION OF WARRANTABLE SERVICE

The question as to whether a repair or replacement is actually a warrantable adjustment is documented in this section to help you make that decision. All warranty claims must be filed within the warranty period of twenty-four (24) months or 6,000 hours and within thirty (30) days of the repair. The claim will not be honored if it does not meet this criteria.

II. DETERMINING WARRANTY RESPONSIBILITY

   A. Has this complaint originated during the stated warranty period?
   B. Is the malfunction a result of abuse or misuses?
   C. Has the unit been maintained properly?
   D. If the complaint has originated during the warranty period, there is no evidence of abuse or misuse and the unit has had proper maintenance, the distributor should proceed to file a warranty claim. This does not, however, ensure that the claim be approved.
   E. Is warranty registration on file?

Determination of Warranty

What is Covered by This Warranty.

TICO warrants, to the original purchaser only, that the truck that is the subject of this sale is free from defects in material and workmanship. The duration of this warranty is as follows:

   a. Frames - As to the main structural frame, seven years from the date of delivery.
   b. TICO Cab – As to the driver’s structural cabin compartment, five years from the date of delivery.
   c. As to all other parts and components, one year from date of delivery or 6,000 hours of use, whichever comes first.

If the purchaser discovers within the applicable period a defect in material or workmanship, it must promptly notify TICO in writing. In any event such notification shall be received by TICO, in the case a defect in the mainframe, no later than 73 months from date of delivery, and in the case of a defect in any other part or component, no later than 25 months from the date of delivery or one month after the first 6,000 hours, whichever comes first. Within a reasonable time after such notification, TICO will correct any defect in material or workmanship with either new or used replacement parts, at TICO’s option.

TICO will pay for the costs of correcting defects as follows:

   a. For defects in material or workmanship during the first twenty-four months from the date of delivery or the first 6,000 hours, whichever comes first, both parts and labor are at TICO’s expense.
   All warranty work is subject to TICO’s prior examination and approval and will be performed by TICO or at service centers designated by TICO. All transportation to and from designated service center will be at the purchaser’s expense and is not included as a cost of repair covered by this warranty. These remedies are the purchaser’s exclusive remedies for breach of warranty.

Standard Warranty Policy

What is Not Covered by This Warranty.

TICO does not warrant engines, transmissions, tires, batteries or any other component which has a warranty covered by its manufacturer. In addition, TICO does not warrant (a) damage caused by use of the truck for purposes other than those for which it was designed; (b) damage caused by accident or the negligence of the purchaser or any third party or by disasters such as fire, flood, wind and lightning; (c) damage caused by the purchaser’s failure to provide normal maintenance as customarily accepted in the industry or as set forth in the maintenance guidelines; (d) filters, belts, brake linings, lights, breakers, and lubricants which are part of normal maintenance service requirements; (e) damage caused by unauthorized or improper installation of attachments, repairs, modifications or alterations; (f) damage caused by replacement of original parts or components with unauthorized substitutes; (g) damage during shipment, or (h) any other abuse or misuse by purchaser.

Disclaimer of Warranty.

THE FOREGOING WARRANTIES ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.
Limitation of Remedies.
In no case shall TICO be liable for any special, incidental, or consequential damages based upon breach of warranty, breach of contract, negligence, strict tort, or any other legal theory. Such damages include, but are not limited to, loss of profits, loss of savings or revenue, loss of use of the truck or any associated equipment, cost of capital, cost of any substitute truck, equipment, facilities, or services, downtime, the claims or third parties including customers, and injury to property. This limitation does not apply to claims for personal injury. Some states do not allow limit on warranties, or on remedies for breach in certain transactions. In such states, the limits in this paragraph and in paragraph (3) may not apply.

Warranty Claim Procedures.
The purchaser must notify TICO of a warranty claim prior to any warranty work. TICO will provide the purchaser with further instructions on how to proceed with such warranty claim. Notice of a warranty claim and all other warranty correspondence must be sent digitally to Warranty@ticotracitors.com or physically to: TICO, 66 Cypress Ridge Dr, Ridgeland, SC 29936. TICO may designate new or additional addresses.

Time Limit for Bringing Suit.
Any action for breach of warranty as to the mainframe must be commenced within 75 months following delivery of the truck. Any action for breach of warranty as to any other part or component must be commenced within 27 months following delivery of the truck or within the first three months following the first 6000 hours of use, whichever comes first.

No Other Warranties.
Unless modified in writing signed by both parties, this agreement is understood to be the complete, and exclusive agreement between the parties, superseding all prior agreements, oral or written, and all other communications between the parties (including without limitation any terms and conditions contained in any purchase order or sales invoice issued pursuant to the sale of this truck) relating to the subject matter of this agreement. No employee of TICO or any other party is authorized to make any warranty in addition to those made in this agreement.

Warranty Registration.
This warranty is conditioned upon receipt by TICO of a completed warranty registration following delivery of vehicle to the customer. The customer registration must be on file for any warranty claim to be considered. If no Warranty registration is filed the warranty of the tractor is initiated at the ship date.

*Note: Contact specific product OEM: Cummins, Dana, Meritor, Allison.

Major Components Warranty
*For additional warranty information, please contact the major components manufacturer or visit their websites.

1. Disclaimer of Warranty.
THE FOREGOING WARRANTIES ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

2. Limitation of Remedies.
In no case shall TICO be liable for any special, incidental or consequential damages based upon breach of warranty, breach of contract, Negligence, strict tort, or any other legal theory. Such damages include, but are not limited to, loss of profits, loss of savings or revenue, loss of use of the coach body or any associated equipment, cost of capital, cost of any substitute coach body, equipment, facilities or services, downtime, the claims of third parties including customers, and injury to property. This limitation does not apply to claims for personal injury. Some states do not allow limits on warranties, or on remedies for breach in certain transactions. In such states, the limits in this paragraph and in paragraph (3) may not apply.

3. Time Limit for Bring Suit.
Any action for breach of warranty must be commenced within three months following the expiration of the warranty period.

4. No Other Warranties.
Unless modified in a writing signed by both parties, this agreement is understood to be the complete and exclusive agreement between the parties, superseding all prior agreements, oral or written, and all other communications between the parties (including without limitation any terms and conditions contained in any purchase order or sales invoice issued pursuant to the sale of this truck) relating to the subject matter of this agreement. No employee of TICO or any other party is authorized to make any warranty in addition to those made in this agreement.
# 2018 FLAT RATE GUIDELINE

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<tr>
<td>4.30</td>
<td>Harness, Chassis-to-Diesel Exhaust Fluid (DEF) Tank; R&amp;R</td>
<td>1.1</td>
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<td>4.31</td>
<td>Harness, Chassis-to-Selective Catalytic Reduction (SCR) System; R&amp;R</td>
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<td>4.32</td>
<td>Harness, Engine; R&amp;R</td>
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<td>4.33</td>
<td>Hose, Diesel Exhaust Fluid (DEF); R&amp;R</td>
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<tr>
<td>4.34</td>
<td>Hose, Lower Radiator; R&amp;R</td>
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<td>Includes Drain and Refill</td>
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<tr>
<td>4.35</td>
<td>Hose, Lower Tube; R&amp;R (Each)</td>
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<tr>
<td>4.36</td>
<td>Hose, Upper Radiator; R&amp;R</td>
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<td>Includes Drain and Refill</td>
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<tr>
<td>4.37</td>
<td>Hose, Upper Tube, Charge Air Cooler (CAC); R&amp;R (Each)</td>
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<tr>
<td>4.38</td>
<td>Indicator, Filter, Air Intake Tube; R&amp;R</td>
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<td>Insert Step, Bottom of Fuel Tank; R&amp;R</td>
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<td>4.40</td>
<td>Isolator, Engine; R&amp;R (Each)</td>
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<td>4.41</td>
<td>Isolator, Rubber Tank Strap; R&amp;R (Each)</td>
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<td>4.42</td>
<td>Line, Fuel Return; R&amp;R</td>
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<td>4.43</td>
<td>Line, Fuel Tank-to-Filter; R&amp;R</td>
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<td>Includes R&amp;R of Platform</td>
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<td>4.44</td>
<td>Mount, Lower Radiator; R&amp;R</td>
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<td>Mount, Side of Radiator; R&amp;R</td>
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<td>4.46</td>
<td>Mounting Band, Air Cleaner; R&amp;R (Each)</td>
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<td>4.47</td>
<td>Muffler; R&amp;R</td>
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<td>4.48</td>
<td>Muffler Extension; R&amp;R</td>
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<td>4.49</td>
<td>Oil, Engine; Drain and Refill</td>
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<td>Pipe, Exhaust Pipe; R&amp;R</td>
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<td>4.51</td>
<td>Platform, Fuel Tank; R&amp;R</td>
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<td>4.52</td>
<td>Precleaner, Air Intake; R&amp;R</td>
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<td>4.53</td>
<td>Radiator, Drain and Refill</td>
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<td>4.54</td>
<td>Radiator; R&amp;R</td>
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<td>4.55</td>
<td>Sender, Fuel Level; R&amp;R</td>
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<td>4.56</td>
<td>Sensor, Low Coolant; R&amp;R</td>
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<td>4.57</td>
<td>Separator, Fuel/Water; R&amp;R</td>
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<td>4.58</td>
<td>Sight Glass, Surge Tank; R&amp;R</td>
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<td>Strap, Fuel Tank; R&amp;R (Each)</td>
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<td>HOUR</td>
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<td>4.60</td>
<td>Surge Tank; R&amp;R</td>
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<td>4.61</td>
<td>Tank, Diesel Exhaust Fluid (DEF); R&amp;R</td>
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<td>4.62</td>
<td>Tank, Fuel; Drain and Refill</td>
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<td>4.63</td>
<td>Tank, Fuel; R&amp;R</td>
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<td>Includes Drain and Refill</td>
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<td>4.64</td>
<td>Tank, Lower Radiator; R&amp;R</td>
<td>3.1</td>
<td>Includes Drain and Refill</td>
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<td>Tank, Upper Radiator; R&amp;R</td>
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<td>Tube, Air Cleaner-to-Turbo; R&amp;R</td>
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<td>4.67</td>
<td>Tube, Exhaust Flex; R&amp;R</td>
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<td>4.68</td>
<td>Tube, Lower, Charge Air Cooler (CAC); R&amp;R</td>
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<td>4.69</td>
<td>Tube, Selective Catalytic Reduction (SCR) Decomposition; R&amp;R</td>
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<td>Tube, Upper, Charge Air Cooler (CAC); R&amp;R</td>
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<td>4.71</td>
<td>Valve, Radiator Drain; R&amp;R</td>
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<td>4.72</td>
<td>Vent Line, Fuel Tank; R&amp;R</td>
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**5—Transmission**

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<tr>
<td>5.01</td>
<td>Bracket, Rear Engine/Transmission Mount; R&amp;R (Each)</td>
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<tr>
<td>5.02</td>
<td>Cooler, Transmission; R&amp;R</td>
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<td>Includes Refill</td>
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<td>Engine &amp; Transmission; R&amp;R</td>
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<td>5.04</td>
<td>Harness, Transmission; R&amp;R</td>
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<tr>
<td>5.05</td>
<td>Key Pad, Transmission Selector; R&amp;R</td>
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<td>5.06</td>
<td>Transmission; R&amp;R</td>
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<td>5.07</td>
<td>Transmission Fluid; Drain and Refill</td>
<td>1.2</td>
<td>Includes Replace Internal Filter</td>
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<td>5.08</td>
<td>Tube, Transmission Dipstick; R&amp;R</td>
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<td>Includes Drain and Refill</td>
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**6—Front Axle and Steering**

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<td>Axle, Front; R&amp;R</td>
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<td>6.02</td>
<td>Bearing, Front Axle Wheel; Adjustment (Each)</td>
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<tr>
<td>6.03</td>
<td>Bearing, Front Axle Wheel; R&amp;R (Each)</td>
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<td>6.04</td>
<td>Bearing, Front Axle Wheel; Repack/Grease (Each)</td>
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<td>6.05</td>
<td>Bushing, Frame, Rear Shackle; R&amp;R (Each)</td>
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<td>6.06</td>
<td>Bushing, Spring, Leaf; R&amp;R</td>
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<tr>
<td>6.07</td>
<td>Column, Steering; R&amp;R</td>
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<tr>
<td>6.08</td>
<td>Drag Link; R&amp;R</td>
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<tr>
<td>6.09</td>
<td>End, Tie Rod; R&amp;R</td>
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<td>6.10</td>
<td>End, Tie Rod; R&amp;R</td>
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<td>Includes Setting Toe-In</td>
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<td>6.11</td>
<td>Hose, Pressure, Pump-to-Gear; R&amp;R</td>
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<td>6.12</td>
<td>Hose, Return, Gear-to-Tank; R&amp;R</td>
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<td>6.13</td>
<td>Hose, Suction, Tank-to-Pump; R&amp;R</td>
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<td>6.14</td>
<td>Hub; R&amp;R</td>
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<td>6.15</td>
<td>Hubcap; R&amp;R</td>
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<td>Includes Fill With Oil</td>
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<td>6.16</td>
<td>Kingpin Kit; R&amp;R (Each)</td>
<td>5.3</td>
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<tr>
<td>6.17</td>
<td>Knuckle Assembly; R&amp;R (Each)</td>
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### 6—Pivot Arm, Axle; Adjust

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<td>6.18</td>
<td>Pin, Front Spring; R&amp;R (Each)</td>
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<td>6.19</td>
<td>Pitman Arm; R&amp;R</td>
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<td>6.20</td>
<td>Poppet, Steering Gear; Adjustment</td>
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<td>6.21</td>
<td>Power Steering System; Analyze</td>
<td>0.6</td>
<td>Includes Flow &amp; Pressure Check</td>
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<td>6.22</td>
<td>Pump, Power Steering; R&amp;R (Optional dedicated steering pump)</td>
<td>1.4</td>
<td>Includes Drain and Refill</td>
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<td>6.23</td>
<td>Rubber Pad, Axle Stop; R&amp;R (Each)</td>
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<td>6.24</td>
<td>Seal, Hub; R&amp;R (Each)</td>
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<td>6.25</td>
<td>Seal, Steering Gear Input Shaft; R&amp;R</td>
<td>1.0</td>
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<td>6.26</td>
<td>Shackle, Rear Spring; R&amp;R (Each)</td>
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<tr>
<td>6.27</td>
<td>Slip-Joint, Steering Column; R&amp;R</td>
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<td>6.28</td>
<td>Spacer, Axle; R&amp;R</td>
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<tr>
<td>6.29</td>
<td>Spring, Leaf; R&amp;R (Each)</td>
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<td>6.30</td>
<td>Steering Arm; R&amp;R</td>
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<td>6.31</td>
<td>Steering Gear; R&amp;R</td>
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<td>Includes Adjustment</td>
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<td>6.32</td>
<td>Steering Wheel; R&amp;R</td>
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<td>6.33</td>
<td>Stop, Axle; R&amp;R</td>
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<tr>
<td>6.34</td>
<td>Stops, Axle Steering; Adjustment</td>
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<tr>
<td>6.35</td>
<td>Tie Rod End, Cylinder; R&amp;R (Each)</td>
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<td>6.36</td>
<td>Tie Rod; R&amp;R</td>
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<td>Includes Setting Toe-In</td>
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<td>6.37</td>
<td>Toe-In; Adjustment</td>
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<tr>
<td>6.38</td>
<td>U-Bolt, Axle Mounting; R&amp;R (Each)</td>
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<tr>
<td>6.39</td>
<td>Wheel &amp; Tire, Front Axle; R&amp;R</td>
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### 6.38 U-Bolt, Axle Mounting; R&R

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<tr>
<td>6.38</td>
<td>U-Bolt, Axle Mounting; R&amp;R (Each)</td>
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### 6.39 Wheel & Tire, Front Axle; R&R

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<td>6.39</td>
<td>Wheel &amp; Tire, Front Axle; R&amp;R</td>
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### 7—Rear Axle

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<td>Bearing, Rear Wheel; Adjustment (Each)</td>
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<td>Bearing, Rear Wheel; R&amp;R (Each)</td>
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<td>Bolt, Axle; R&amp;R (Each)</td>
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<td>7.05</td>
<td>Differential Carrier; R&amp;R</td>
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<td>7.06</td>
<td>Drive Shaft; R&amp;R</td>
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<td>7.07</td>
<td>Gasket, Differential Carrier; R&amp;R</td>
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<td>7.10</td>
<td>Seal, Pinion; R&amp;R</td>
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<td>7.12</td>
<td>Stud, Axle Flange; R&amp;R</td>
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<td>Does Not Include Removal of Axle Shaft</td>
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<td>Stud, Wheel; R&amp;R</td>
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<td>U-Joint; R&amp;R</td>
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<td>Yoke, Pinion; R&amp;R</td>
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### 8—Air System

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<td>Governor, Air; Adjustment</td>
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<td>Governor, Air; R&amp;R</td>
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<td>Hose, Compressor Intake; R&amp;R</td>
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<td>Line, Discharge, Compressor; R&amp;R</td>
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<td>Pedal, Throttle; R&amp;R</td>
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<td>Strap, Air Tank; R&amp;R (Each)</td>
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<td>Switch, Low-Pressure; R&amp;R</td>
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<td>Valve, BP-R1 Relay; R&amp;R</td>
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<td>Valve, Brake Treadle; R&amp;R</td>
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<td>Valve, Check, Air Tank; R&amp;R (Each)</td>
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<td>Valve, Double Check; R&amp;R</td>
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<td>8.16</td>
<td>Valve, Three-Position Door; R&amp;R</td>
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<td>8.17</td>
<td>Valve, Heated, Spitter; R&amp;R</td>
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<td>8.18</td>
<td>Valve, Pressure Protection, Air Tank; R&amp;R</td>
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<td>8.19</td>
<td>Valve, Pressure Relief, Supply Tank; R&amp;R</td>
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<td>8.20</td>
<td>Valve, Quick Release; R&amp;R</td>
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<td>Valve, Tractor Park Brake; R&amp;R</td>
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<td>Valve, Tractor Protection; R&amp;R</td>
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<td>Valve, Trailer Parking Brake; R&amp;R</td>
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### 9—ABS/ATC System

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<td>Harness, Antilock Braking System (ABS) Cab; R&amp;R</td>
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<td>Harness, Antilock Braking System (ABS) Front Chassis; R&amp;R</td>
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<td>Harness, Antilock Braking System (ABS) Rear Chassis; R&amp;R</td>
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<td>Sensor, Antilock Braking System (ABS) Front Wheel; R&amp;R (Each)</td>
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<td>Sensor, Rear Wheel; R&amp;R (Each)</td>
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<td>9.09</td>
<td>Valve, Antilock Braking System (ABS) Modulator; R&amp;R (Each)</td>
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### 11—Hydraulic System

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<td>Hydraulic Fluid; Drain and Refill</td>
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<td>Filter, Hydraulic; R&amp;R</td>
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<td>Head, Hydraulic Filter; R&amp;R</td>
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<td>Hose, Cab Latch Hydraulic; R&amp;R (Tank-to-Pump, Pump-to-Latch, or Latch-to-Cylinder)</td>
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<td>Includes Drain and Refill Tank</td>
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<td>Hose, Control Valve-to-Tee; R&amp;R (Each)</td>
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<td>Leak-Down Test, Cylinder</td>
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<td>Power Take-Off (PTO); R&amp;R</td>
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<td>Pressure, Hydraulic System; Check and Adjustment</td>
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<td>Valve, Cab Suspension Leveling; R&amp;R</td>
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### 12—Boom and Fifth Wheel

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<td>Bracket, Lower Cab Tilt Cylinder Support; R&amp;R</td>
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<td>Door, Rear; Adjustment</td>
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<td>Fan, Cab Auxiliary; R&amp;R</td>
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<td>With Auto Lube</td>
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<td>Fender, Right Side; R&amp;R</td>
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<td>Without Auto Lube</td>
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<td>Handle, Cab Grab; R&amp;R (Each)</td>
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<td>Handle, Rear Door; R&amp;R</td>
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### 13—Rearview Mirrors, Seats, and Related Parts

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### 14—Covers and Guards

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<td>Bumper, Front; R&amp;R</td>
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<td>Fender, Rear Axle Quarter; R&amp;R (Each)</td>
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<td>Guard, Grille; R&amp;R</td>
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<td>Guard, Cab Protection Bar; R&amp;R</td>
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<td>Guide, Boom; R&amp;R (Each)</td>
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<td>Guide, Boom; R&amp;R (Each) Additional</td>
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<td>Mud Flap; R&amp;R (Each)</td>
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<td>Platform, Rear Step; R&amp;R</td>
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<td>Platform, Transmission Cover; R&amp;R</td>
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<td>Radiator, Skid Plate; R&amp;R</td>
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# Heating and Air Conditioning

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<th>HOUR</th>
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<td>Evacuate and Recharge System; Check for Operation &amp; Leaks</td>
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<td>Full Charge of 2.50 lbs.Thermotek 0.09 For ACC Systems Operations Do Not Include Refrigerant Recovery or Evacuation</td>
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CONTACT TICO SUPPORT

To contact TICO factory technical support:

- Call 1.833.UPTIME2 (833.878.4632)
- Email inquiries to: ticoservice@ticotractors.com
- Additional information is available at: ticotractors.com/support

To find a local dealer for support, service, or parts visit: ticotractors.com/dealer

The dealer locator can also be found on the online support page. This page will provide additional resources such as the TICO operator’s manual and warranty submission.
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SAFETY

Introduction
Safety is the most important element of any repair procedure for TICO Pro-Spotter terminal trucks. Knowledge of the procedure to be performed and safe work habits are essential to preventing death, personal injury, or property damage. Use the following statements as a common-sense guide to proper work and tool-use habits.

Prepare for the Job
Preparation is essential to complete a procedure in a safe and efficient manner.

- Wear proper clothing. Loose or baggy clothing could become tangled in moving parts.
- Use eye/face protection. Always use proper eye/face protection to protect your eyes from flying debris or chemical splatters.
- Wear protective footwear. Wear safety shoes (steel-toe) to protect your feet from falling objects.
- Use gloves when handling parts. Parts may have sharp edges or may be hot to touch.
- Remove jewelry prior to servicing electrical systems.
- Prepare proper tools and equipment. Always use the correct tool for the job. Improper or homemade tools can cause injury or tractor damage.
- Prepare needed parts and materials. Gather the needed parts and materials before beginning the procedure.
- Allow the tractor to cool. Many components can get hot during operation. Be sure to allow enough time for components to cool before beginning service.
- Prepare proper work-space lighting. A well-lit work area can make the job easier.
- Follow procedures and safety warnings. Service procedures are written to be as safe and efficient as possible. Never take shortcuts.
- Be prepared for emergencies. Accidents can happen, even under the best conditions. Fire extinguishers and first aid kits should be well maintained and easily accessible.

Safety Notices
Throughout this manual, the following key safety words will be used to alert the reader of potential hazards. Become familiar with these words and their meaning. Take all precautions to avoid the hazards described.

This safety alert symbol is used to alert you to potential hazards.

- **DANGER**
  Indicates a potentially imminently hazardous situation, which if not avoided, WILL result in death or serious injury.

- **WARNING**
  Indicates a potentially hazardous situation, which if not avoided, COULD result in death or serious injury.

- **CAUTION**
  Indicates a potentially hazardous situation, which if not avoided, MAY result in minor or moderate injury.

- **NOTICE**
  Indicates a potentially hazardous situation, which if not avoided, MAY result in property damage. It may also be used to alert against unsafe practices.

Safety Labels
Become familiar with the TICO Pro-Spotter terminal tractor safety labels and locations. Safety decals are critical to the safe operation of the terminal tractor. Inspect the tractor for any damaged, missing, or unreadable labels. Replace labels as needed before placing the tractor back in service.
Keep Work Area Clean
A clean, organized, well-lit work area is important to promote safe working conditions.

- Keep floor clean of debris and clear of parts and tools.
- Clean up any spilled fuel, oil, and/or chemicals immediately.
- Store all air hoses and electrical cords properly when not in use.

Keep Work Area Well Ventilated

⚠️ WARNING
Never operate the engine without proper ventilation; exhaust fumes could be fatal if inhaled.

Certain test and adjustment procedures require the engine to be running. Be sure work area is well ventilated; never run the engine in an enclosed area.

Use Proper Eye and Face Protection

⚠️ WARNING
Always use approved personal protection equipment. Avoid workplace hazards by wearing properly maintained, approved eye and face protection. Failure to use appropriate protection equipment could result in death or serious injury.

Always wear eye protection while in a shop environment.
- Safety Glasses: Safety glasses offer a minimum level of protection from flying debris.
- Face Shields: Face shields are often used along with safety glasses to offer a higher level of protection when sparks and flying debris are present.
- Vented Goggles: Goggles offer side protection not offered by safety glasses alone.
- Unvented Goggles: Unvented goggles offer protection from chemical splashes and vapors.

Park Tractor Safely
See Figure 1-1.

⚠️ WARNING
Before cleaning, adjusting, or repairing this tractor, engage park brake, shift transmission to neutral, and stop engine to prevent injuries.
When performing maintenance other than adjustments that require the engine to be running, disconnect the battery negative cables to prevent accidental starting and bodily injury.

1. Park the tractor on a solid, level surface.
2. Shift the transmission to neutral.

Figure 1-1: Trailer Air Supply and Parking Brake Knob

3. Pull the parking brake knob (1) out to apply the parking brake.
4. Allow the engine to run at idle for a minimum of 3 minutes and shut the engine off. Lockout–tagout the tractor.
5. Turn off all electrical lights and accessories.
6. Place wheel chocks or blocks in the front and rear of wheels to prevent the tractor from moving.
7. Lower the fifth wheel if it is in the raised position.

Support Tractor Securely

⚠️ WARNING
- Support the tractor using properly rated jack stands. Never work under a tractor supported only by a jack.
- Do not use wood or concrete blocks to support the tractor. Failure to properly support the tractor could result in death or serious injury.
Use Lifting Equipment Safely

**WARNING**

Always check the lifting capacity and condition of hoists, slings, cables, or chains before use. Using underrated or worn lifting components could result in death or serious injury.

- Always use a lifting device with a lifting capacity greater than the weight of the item being lifted.
- Secure the load to the lifting device using cables, chains, or slings rated to handle the load being lifted. Fasteners being used to connect lifting devices must be strong enough to handle the load. Also, be sure the mounting point of load is strong enough to handle the load.
- When connecting to the load, ensure the load is balanced.
- Always use a lifting device on a hard, level surface.
- Lower the lifting device to the lowest point before moving. Move the load slowly.
- Always support the load as soon as possible; never leave a load suspended in mid-air.

Use Compressed Air and Air Tools Safely

**WARNING**

Always wear approved eye and ear protection while using compressed air. Misuse of compressed air could result in death or serious injury.

- When using air nozzles, air pressure should not exceed 206.8 kPa (30 psi).
- Never direct air nozzles or tools at a person.
- Never point air nozzles directly at skin.

- Compressed air is a useful tool when used in a safe manner.
- Always use eye and ear protection while using compressed air and air tools.
- When using air tools, do not exceed the air pressure rating for the tool.
- When using an impact wrench, always use approved impact sockets. Never use standard sockets on an impact wrench.
- Disconnect the air supply before changing air tool attachments.
- Never point air nozzles or air tools at another person.

Service Tires Safely

**WARNING**

An inflated tire contains explosive force. Use care when handling wheels and tires.

- Always wear safety glasses or goggles.
- Use proper lifting methods when working with wheels and tires.
- When working on an inflated tire, never position yourself directly over the work area.
- When dismounting or mounting tires, use a wheel holder or tire tractor. Use proper tire mounting tools and equipment. Never use screwdrivers or makeshift tools to force a tire on or off a wheel.
- Be sure tire irons and mounting tools are free of grease and oil. Grip them firmly.
- Inspect wheel parts for rust, damage, or distortion. Never use wheels that are out-of-round, rusted, or cracked.
- Never hammer on wheels with a steel hammer. Use rubber-covered hammers.
- When inflating tires, always use an inflation cage. Always stand away from the valve stem.
- Use accurate, tested inflation gauges to set air pressures.

Service Electrical Components Safely

**WARNING**

Always disconnect the battery negative (–) cable first and battery positive cable last. Connect battery positive cable first and battery negative cable last. Be careful when testing live circuits to prevent arcing. Arcing could result in death or serious injury.

- Disconnect the battery negative (–) cable before removing or installing electrical components. Always connect the battery negative (–) cable last.
- Certain test and adjustment procedures must be performed with the battery connected. Use care to prevent arcing when working on live circuits or components. Arcing can cause component damage and could ignite flammable materials.
Service Hydraulic System Safely

**WARNING**

The hydraulic system is under pressure, and the oil may be hot!
- Always allow the tractor to cool completely before performing service.
- Always relieve pressure in the hydraulic system before performing service.
- Always use appropriate safety equipment and clothing to protect exposed skin and eyes from high-pressure oil.
- Tighten all connections to proper specifications before applying pressure.
- Never use bare hands to check for leaks. Oil under pressure can penetrate the skin and can cause gangrene within a few hours if not properly removed. Use a piece of cardboard to check for leaks.

Failure to follow appropriate safety precautions could result in death or serious injury.

Always dispose of used hydraulic oil properly.
(See “Dispose of Waste Materials Safely” on page 1-6.)

Service Cooling System Safely

**WARNING**

Engine coolant is hot and under pressure! Allow the cooling system to cool completely before performing service.
Rotate the filler cap 1/2-turn counterclockwise and allow pressure to vent before removing filler cap.

Failure to follow appropriate safety precautions could result in death or serious injury.

Handle Fuel Safely

Handle fuel with care—it is highly flammable.

**WARNING**

- Never remove the fuel cap from the fuel tank or add fuel when the engine is running or while the engine is hot.
- Do not smoke when handling fuel. Never fill or drain the fuel tank indoors.
- Do not spill fuel. Clean up spilled fuel immediately.
- Never handle or store fuel containers near an open flame or any device that may create sparks and ignite the fuel or fuel vapors.
- Be sure to reinstall and tighten fuel cap securely.
- Use an approved container; the spout must fit inside the fuel filler neck. Avoid using cans and funnels to transfer fuel.

Store fuel according to local, state, or federal ordinances and recommendations from your fuel supplier.
Never overfill or allow the tank to become empty.
Use clean, fresh fuel.
Do not fill above the fuel filler neck.

Handle Chemical Products Safely

**WARNING**

Exposure to chemical products could result in serious injury. Handle chemical products with care. Refer to the chemical manufacturer's Safety Data Sheet (SDS) for information regarding health hazards, safe handling, and emergency response procedures.

Routine service often requires the use of various chemical products, including lubricants and cleaning solutions. Many of these chemicals are flammable and can pose health risks if not handled properly.
- Never mix chemicals. Mixing chemicals can produce toxic or explosive results.
- Follow the manufacturer's recommendations for safe usage and handling of the product.
- Various materials may pose a health hazard if used incorrectly. A Safety Data Sheet (SDS) contains important information regarding proper handling and health hazards, as well as emergency response procedures. Contact the chemical manufacturer to obtain a SDS for the chemical product.

Contact with anti-freeze can damage your skin. Use gloves when working with anti-freeze. If you come in contact with anti-freeze, wash it off immediately.

Always dispose of used engine coolant properly.
(See “Dispose of Waste Materials Safely” on page 1-6.)
Dispose of Waste Materials Safely

Routine service can produce waste products such as used oil, coolant, grease, and used batteries. If not handled properly, these materials can pose a threat to the environment.

Collect fluids in well-marked, approved storage containers. Some waste fluids can react with certain types of plastics. Make sure the fluid to be stored is compatible with the storage container. Never use food or beverage containers to store waste fluids.

**IMPORTANT**

Never dispose of waste fluids by pouring on the ground, down sewer drains, or into any body of water.

- Dispose of waste fluids properly at approved local recycling centers. If recycling facilities are not available, contact your local community for the correct disposal procedure for waste fluids.
- Dispose of old batteries properly. Battery electrolyte contains sulfuric acid and other hazardous materials. Never place an old battery in the trash. Batteries must be disposed of in a manner consistent with EPA and/or local regulations.

Store Volatile and Hazardous Materials Safely

Store volatile materials (gasoline, diesel fuel, oil, etc.) in approved containers that are clearly marked. Containers should be stored in an approved safety cabinet away from possible sources of ignition. Storage areas and cabinets should be well ventilated to prevent the possible build-up of fumes.
NOMENCLATURE

See Figures 1-2 and 1-3.

**Figure 1-2: Pro-Spotter (Left Side)**

1. Hour Meter  
2. Steering Gear  
3. Cab Lift Pump  
4. Fuel Filter  
5. Fuel Tank  
6. Diesel Exhaust Fluid (DEF) Tank  
7. Fifth Wheel and Boom

**Figure 1-3: Pro-Spotter (Right Side)**

8. Steer Axle Quarter Fender  
9. Hydraulic Tank  
10. Battery Box  
11. Power Distribution Center (PDC)  
12. Worklight  
13. Air Intake  
14. Engine Compartment  
15. Surge Tank  
16. Air Dryer  
17. Auto Lubrication
# SPECIFICATIONS

## ENGINE
- **Manufacturer**: Cummins®
- **Model (DOT/EPA)**: 2017-B6.7
- **Output (DOT/EPA)**: 149 kW @ 2 400 rpm
  
  200 hp @ 2 400 rpm
- **Torque (DOT/EPA)**: 705 N·m @ 1 500 rpm
  
  520 lb·ft @ 1 500 rpm
- **Model (Off-Road)**: QSB Tier IV Final Diesel
- **Output (Off-Road)**: 118 kW
  
  158 hp
- **Torque (Off-Road)**: 841 N·m
  
  620 lb·ft

## TRANSMISSION
- **Manufacturer**: Allison Transmission®
- **Model**: 3000 RDS Gen V

## FRONT AXLE
- **Manufacturer**: Meritor®
- **Rating**: 5 443 kg
  
  12 000 lb

## REAR AXLE
- **Manufacturer**: Meritor®
- **Rating**: 13 608 kg
  
  30 000 lb

## FRONT SUSPENSION
- **Type**: 6-Leaf front spring
- **Rating**: 6 577 kg
  
  14 500 lb

## BRAKES
- **Type**: Pneumatic (air) brake system
- **Front axle**: ABS/ATV Meritor® 16.5x5” S-cam brakes
  
  Automatic slack adjusters
- **Rear axle**: ABS/ATC Meritor® 16.5x7” S-cam brakes
  
  Automatic slack adjusters
- **Parking**: Spring type on rear axle
- **Emergency**: Automatic application of parking brakes

## STEERING
- **Type**: Mechanical linkage with power assist Sheppard™ M-100
- **Engine**: Engine mounted 20 gpm pump with priority steering

## WHEELS
- **Size**: 22.5” x 8.25” Standard offset 285 mm hub pilot
  
  Two-hand hole

## TIRES
- **Type**: Standard grade 11R x 22.5 tubeless front and rear
- **Height**: Highway tread with load range G

## CAB
- **Material**: Fiberglass composite
- **Height**: 173 cm
  
  68 in
- **Height**: 193 cm
  
  76 in
- **Width**: 169.55 cm
  
  66.75 in
- **Depth**: 148.6 cm
  
  58.5 in

## CAB TILTING
- **Type**: Electric/hydraulic cab lift system
- **Capability**: 35° under power assist, with manual 90° tilt capability

## CAB SUSPENSION
- **Type**: Dual air-bag system

## CAB MOUNTING
- **Type**: Rubber cushion front cab pivots
- **Type**: Safety type cab latching

## DOORS
- **Type**: Lockable, air operated, poly-carbonate transparent rear door
- **Height**: 183 cm (72 in) high with optional raised roof

## HEATER
- **Type**: DOT/EPA: 49 300 BTU, 650 CFM fresh air heater
- **Type**: Off-road: 40 000 BTU fresh air heater

## DEFROSTER
- **Type**: Heater-integrated

## DASH PANEL
- **Type**: Removable for easy maintenance with speedometer, LED warning indicator display, engine oil pressure gauge, hour meter, coolant temperature gauge, voltmeter, ignition switch, dual air gauge, low air pressure warning light and alarm, fuel gauge, and diesel exhaust fluid (DEF) gauge (DOT/EPA only).
WARNING DEVICES:
- Trailer ABS Fault Code ......................... Light
- ATC Automatic Traction Control Active ........ Light
- Charging System Indicator ....................... Light
- Lo-Air Air Pressure Low ......................... Light and Alarm
- Engine Major Fault Code ....................... Light
- Warning Minor Engine Fault Code ............. Light
- WTS Wait to Start Warning ...................... Light
- Comm J1939 Datalink Backbone Failure ........ Light
- Trans Temp Exceeds Parameters ............... Light
- Check Trans Fault Code ......................... Light
- Regen Icon Exhaust Regeneration Required ... Light

COOLING SYSTEM
Fin and tube radiator with integral charge air cooler (CAC) mounted on rubber shock pads. Remote surge tank. System has a 50% solution of permanent type anti-freeze with transmission oil cooler in lower radiator.
Capacity ................ 53 L (14 gal)

FUEL TANK .................. 246 L (65 gal)

DEF TANK (DOT/EPS ONLY) .. 19 L (5 gal)

EXHAUST
10 cm (4 in) vertical stack mounted inboard on the cab protection bar with an aluminum muffler shield.

FILTERTS
- Engine Air ..................... Dry type air cleaner
- Fuel (2) .................. Fleetguard® fuel/water separator, frame mounted
- Hydraulic Pump .......... Fleetguard® engine mounted
- Full flow spin-on element with intake strainer
- Replaceable cartridge
- Engine Oil Filter .......... Fleetguard®

ELECTRICAL SYSTEM
12-Volt negative ground with circuit breakers
- ALTERNATOR ................ 160 Amp, Delco® 24SI
- STARTER ................... 12 Volt, Delco® with lockout
- BATTERY ............ Two 12V 750CCA 31-LHD

AIR SYSTEM
- WABCO 18.7 CFM turbocharged air compressor
- Three-tank reservoir system totaling 77 576 cm³ (4 734 in³)

DIMENSIONS
- Height .................. 312 cm (123 in)
- Width .................. 244 cm (96 in)
- Length ................. 511 cm (201 in)
- Wheelbase .......... 295 cm (116 in)

VEHICLE LOAD CAPACITY
- GVW .................. 9 072 kg (20 000 lb)
- GCW .................. 36 287 kg (80 000 lb)

WEIGHT (average) ........ 6 123 kg (13 500 lb)

TURNING RADIUS ........ 6.2 m (20.5 ft)

DRAW BAR PULL ............ 5 762 kg (12 702 lb)

GRADEABILITY .......... @ capacity GCW 16%

HYDRAULIC SYSTEM FOR 5TH WHEEL
Vented 68 L (18 gal) hydraulic tank with inboard mounted sight glass. Engine mounted 20 gpm hydraulic pump.

FIFTH WHEEL & BOOM ASSEMBLY
Cab-controlled air unlatch and automatic latch.
Dual 12.7 cm (5 in) power up and down lift cylinders

FIFTH WHEEL
- Manufacturer ................ Holland®
- Model .................. 3 500
- Lift Rating ............ 31 751 kg (70 000 lb)
- Lift Height ........... 46 cm (18 in)

TRAILER EQUIPMENT
- Air .................. Two 5 m (15 ft) straight rubber air lines
- Color coded glad hands
- Electrical ............ 12-Volt power supply trailer light cord
- 7-Wire trailer socket and cable
FASTENERS

Fasteners consist of screws, bolts, studs, and nuts. These parts are used to hold components together. To prevent loosening, fasteners use locking devices such as locking tabs, thread adhesive, or lock nuts and washers.

When removing fasteners, inspect all parts for wear or damage and replace as needed. Lock nuts with nylon inserts must be replaced after removal. For installation, clean and apply a penetrating oil to fasteners to prevent rust and breakage.

Special tools may be needed to remove broken and extremely rusted fasteners. These special tools are commonly available at local tool stores.

When removing washers, inspect for wear or damage and replace as needed. Always install lock washers and flat washers exactly as they were removed. Never use a lock washer on a material softer than the washer metal.

Fastener Sizes

See Figures 1-4—1-10.

TICO terminal tractors use both standard and metric fasteners on all equipment. Standard fasteners are often referred to as USS or SAE. A standard fastener cannot be substituted with a metric fastener. A metric fastener cannot be substituted with a standard fastener. A standard wrench should only be used on standard nuts and bolts. A metric wrench should only be used on metric nuts and bolts. It is important to know the difference between these two hardware characteristics.

NOTE

SAE refers to a non-metric fine thread fastener. USS refers to a non-metric coarse thread fastener.

Standard bolts are sized according to the diameter (3) in inches, the thread pitch (number of threads per inch) (4), and the length (2) in inches. For example, a standard 1/2 - 13 x 2 bolt is 1/2 inch in diameter, has 13 threads per inch and is 2 inches long.

Figure 1-4: Standard Bolt Dimensions

Metric bolts are sized according to the diameter (7) in millimeters, the thread pitch (distance between threads in millimeters) (8), and the length (6) in millimeters. For example, an M12 - 1.75 x 50 metric bolt is 12 mm in diameter, has a thread pitch of 1.75 mm and is 50 mm long.

Figure 1-5: Metric Bolt Dimensions

Bolt heads are also used to set apart standard from metric fasteners. The width of a standard bolt head is measured in inches. Standard bolt heads also have radial lines that signify the bolt grade. The bolt grade is the strength of the bolt. The more grade lines a bolt head has, the stronger the bolt.

The width of a metric bolt head is measured in millimeters. Metric bolt heads also show the property class number of the bolt. The property class is the strength of the bolt. A stronger bolt will have a larger property class number.

The same applies to standard and metric nuts. Standard nuts are marked with dots to show the grade strength. The more dots a nut has, the stronger the nut. Metric nuts show the property class number. A stronger nut will have a larger property class number.

Metric studs are also labeled with the same property class number used for metric bolts. However, smaller studs use a geometric code to signify property class.

NOTE

If a fastener has no grade or property class marking, verify if it is standard or metric by measuring the thread pitch.

When replacing standard or metric fasteners, be sure the new part is of the same or larger grade or property class. Always install fasteners in the same location they were removed.
**Figure 1-6: Standard Bolt Grade Markings**

1. Bolt Grade 1 or 2
2. Bolt Grade 5
3. Bolt Grade 8
4. Bolt Grade 8.2

**Figure 1-7: Metric Bolt Property Class Markings**

5. Bolt Class 4.6
6. Bolt Class 4.8
7. Bolt Class 5.8
8. Bolt Class 8.8
9. Bolt Class 9.8
10. Bolt Class 10.9

**Figure 1-8: Standard Hex Nut Grade Markings**

11. Hex Nut Grade 5 (3 dots)
12. Hex Nut Grade 8 (6 dots)

**Figure 1-9: Metric Hex Nut Property Class Markings**

13. Hex Nut Property Class 9
14. Hex Nut Property Class 10

**Figure 1-10: Metric Stud Property Class Markings**

15. Metric Stud
16. Stud Property Class 9.8
17. Stud Property Class 10.9
18. Stud Property Class 8.8
Tightening Sequences and Procedures

Torque
It is important that fasteners get tightened using the correct torque value. Too much torque can cause the fastener to break or become weak. Not enough torque will cause the fastener to be loose. Be sure to follow the torque instructions in this TICO service manual or the provided manufacturer’s manual. If a specific torque value is not listed, use the torque chart found in this section. The size and grade or property class must be known to determine how much force to use. More torque can be used on fasteners with higher grade and property class ratings.

Tightening Sequences
It is important to understand how a tightening sequence works to prevent bending or deforming of components. When fasteners are arranged in a pattern, they must be tightened or loosened in a specific order. Oil pans and cylinder heads are a couple examples that use fasteners in a pattern.

Follow the instruction in this TICO service manual for the correct tightening sequence. If the sequence is not stated, start by installing all nuts and bolts only finger tight. Then apply one full turn to each fastener, working in a star pattern. Repeat the star pattern, only applying one half turn for this sequence. Lastly, tighten each fastener by applying one quarter turn until the proper torque is reached. The reverse of this process is used to remove fasteners.

TORQUE CHART
This torque chart is to be used as a guide when specific torque values are not listed in the instructions. The torque values in the chart are approximate and are for reference only when tightening fasteners. It is recommended that nuts and bolts be of the same standard grade. If a nut and bolt are of different grades, use the torque value of the lower grade fastener.

The torque values in the Standard Fastener Torque Values table, See Table 1-1 on page 1-13, are based on a bolt pre-load stress of 75% of the proof strength. Grade 2 fasteners with a bolt size from 3/8” to 3/4” have a proof strength of 55 000 psi. Bolt sizes from 7/8” to 1-3/8” have a proof strength of 33 000 psi. Grade 5 fasteners with a bolt size from 3/8” to 1” have a proof strength of 85 000 psi. Bolt sizes from 1-1/8” to 1-3/8” have a proof strength of 74 000 psi. Grade 8 fasteners have a proof strength of 120 000 psi.

The torque values in the Metric Fastener Torque Values table, See Table 1-2 on page 1-13, have a proof strength equal to or greater than the tensile strength of the bolt. A Class 4.6 fastener will have an approximate tensile strength of 400 MPa (58 015 psi) and 80% yield strength. Class 8.8 fasteners will have an approximate tensile strength of 800 MPa (116 030 psi) and 80% yield strength. Class 10.9 fasteners will have an approximate tensile strength of 1 000 MPa (145 038 psi) and 90% yield strength.

**IMPORTANT**
Applying too much or too little torque can cause damage to components. Caution should always be used when applying any torque value. Use these torque values at your own risk.
### Table 1-1: Standard Fastener Torque Values

<table>
<thead>
<tr>
<th>SIZE</th>
<th>UNITS</th>
<th>GRADE 2</th>
<th>GRADE 5</th>
<th>GRADE 8</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lubricated</td>
<td>Dry</td>
<td>Zinc Plated</td>
</tr>
<tr>
<td>3/8&quot;-16</td>
<td>N·m (lb·ft)</td>
<td>20.3 (15)</td>
<td>27.1 (20)</td>
<td>24.4 (18)</td>
</tr>
<tr>
<td>3/8&quot;-24</td>
<td>N·m (lb·ft)</td>
<td>23.0 (17)</td>
<td>31.2 (23)</td>
<td>27.1 (20)</td>
</tr>
<tr>
<td>7/16&quot;-14</td>
<td>N·m (lb·ft)</td>
<td>32.5 (24)</td>
<td>43.4 (32)</td>
<td>39.3 (29)</td>
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<tr>
<td>7/16&quot;-20</td>
<td>N·m (lb·ft)</td>
<td>36.6 (27)</td>
<td>48.8 (36)</td>
<td>43.4 (32)</td>
</tr>
<tr>
<td>1/2&quot;-13</td>
<td>N·m (lb·ft)</td>
<td>50.2 (37)</td>
<td>66.4 (49)</td>
<td>57.9 (44)</td>
</tr>
<tr>
<td>1/2&quot;-20</td>
<td>N·m (lb·ft)</td>
<td>55.6 (41)</td>
<td>74.6 (55)</td>
<td>66.4 (49)</td>
</tr>
<tr>
<td>5/8&quot;-11</td>
<td>N·m (lb·ft)</td>
<td>99.0 (73)</td>
<td>131.5 (97)</td>
<td>118.0 (87)</td>
</tr>
<tr>
<td>5/8&quot;-18</td>
<td>N·m (lb·ft)</td>
<td>111.2 (82)</td>
<td>149.1 (110)</td>
<td>134.2 (99)</td>
</tr>
<tr>
<td>3/4&quot;-10</td>
<td>N·m (lb·ft)</td>
<td>174.9 (129)</td>
<td>233.2 (172)</td>
<td>210.2 (155)</td>
</tr>
<tr>
<td>3/4&quot;-16</td>
<td>N·m (lb·ft)</td>
<td>195.2 (144)</td>
<td>260.3 (192)</td>
<td>234.6 (173)</td>
</tr>
<tr>
<td>7/8&quot;-9</td>
<td>N·m (lb·ft)</td>
<td>169.5 (125)</td>
<td>226.4 (167)</td>
<td>203.4 (150)</td>
</tr>
<tr>
<td>7/8&quot;-14</td>
<td>N·m (lb·ft)</td>
<td>167.1 (138)</td>
<td>249.5 (184)</td>
<td>223.7 (165)</td>
</tr>
</tbody>
</table>

### Table 1-2: Metric Fastener Torque Values

<table>
<thead>
<tr>
<th>SIZE</th>
<th>UNITS</th>
<th>CLASS 4.6</th>
<th>CLASS 8.8</th>
<th>CLASS 10.9</th>
</tr>
</thead>
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<tr>
<td></td>
<td></td>
<td>Lubricated</td>
<td>Dry</td>
<td>Zinc Plated</td>
</tr>
<tr>
<td>M6-1</td>
<td>N·m (lb·ft)</td>
<td>2.7 (2)</td>
<td>4.1 (3)</td>
<td>4.1 (3)</td>
</tr>
<tr>
<td>M7-1</td>
<td>N·m (lb·ft)</td>
<td>5.4 (4)</td>
<td>6.8 (5)</td>
<td>5.4 (4)</td>
</tr>
<tr>
<td>M8-1.25</td>
<td>N·m (lb·ft)</td>
<td>8.1 (6)</td>
<td>9.7 (5)</td>
<td>8.1 (6)</td>
</tr>
<tr>
<td>M10-1.5</td>
<td>N·m (lb·ft)</td>
<td>14.9 (11)</td>
<td>19.0 (14)</td>
<td>16.3 (12)</td>
</tr>
<tr>
<td>M12-1.75</td>
<td>N·m (lb·ft)</td>
<td>25.8 (19)</td>
<td>33.9 (25)</td>
<td>28.5 (21)</td>
</tr>
<tr>
<td>M16-2</td>
<td>N·m (lb·ft)</td>
<td>40.7 (30)</td>
<td>54.2 (40)</td>
<td>46.1 (34)</td>
</tr>
<tr>
<td>M20-2.5</td>
<td>N·m (lb·ft)</td>
<td>63.7 (47)</td>
<td>84.1 (62)</td>
<td>71.9 (53)</td>
</tr>
<tr>
<td>M22-2.5</td>
<td>N·m (lb·ft)</td>
<td>123.4 (91)</td>
<td>165.4 (122)</td>
<td>141.0 (104)</td>
</tr>
<tr>
<td>M24-3</td>
<td>N·m (lb·ft)</td>
<td>169.5 (125)</td>
<td>225.1 (166)</td>
<td>191.2 (141)</td>
</tr>
</tbody>
</table>

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**PRO-SPOTTER**

**GENERAL INFORMATION**

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**TICO Manufacturing**

**Service Manual** 1-13
VEHICLE IDENTIFICATION

Certification Label

See Figures 1-12 and 1-13.
It is required that the Federal Motor Vehicle Safety Standards Certification be affixed to the vehicle. The certification label (1) is located inside the cab on the upper left side. The label shows the vehicle type (2), vehicle identification number (VIN) (3), and date of manufacture (4). It also shows the gross vehicle weight rating (GVWR) (5), front and rear gross axle weight ratings (GAWR) (6), tire size (7), wheel size (8), and cold tire pressure (9) specifications.

Transmission Nameplate

See Figures 1-14 and 1-15.
The transmission nameplate (1) is located on the right rear side of the transmission. The nameplate shows the transmission serial number (4), TransID (TID) level (3), and manufactured date (2). The serial number must be provided when ordering replacement parts or requesting service information.
See the Allison Transmission® manual for more information.
Engine Dataplate

See Figures 1-16 and 1-17.

The engine dataplate (1) shows specific information about your engine. The engine serial number (2) and control parts list (CPL) (3) provide information for ordering parts and service needs.

**NOTES**

- The engine dataplate must not be changed unless approved by Cummins® Engine Company, Inc.
- If the engine dataplate (1) is not legible, the serial number can also be found engraved on the engine block near the oil cooler housing.

See the Cummins® engine manual for more information.

Fifth Wheel Serial Tag

See Figures 1-18 and 1-19.

Fifth wheel serial tag (1) is located on the handle side of the fifth wheel top plate above the fifth wheel bracket pin, or is located on the pickup ramps.

The part number and serial number are listed on the tag.
## Section 2

**PREVENTATIVE MAINTENANCE**

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INTRODUCTION

The purpose of the PREVENTATIVE MAINTENANCE section is to provide service and maintenance personnel with the required service procedures based on hour usage intervals to properly maintain TICO Pro-Spotter terminal trucks.

The TICO Pro-Spotter terminal trucks have been engineered for quick and efficient servicing while minimizing down time. The hydraulic system is responsible for fifth wheel boom and power steering operation.

Service and maintenance personnel should inspect the entire hydraulic system frequently for leaks, loose fittings, or damage.

For additional information, please contact TICO factory support. See “CONTACT TICO SUPPORT” on page 0-15.

DAILY PRE-OPERATION CHECKLIST

The Daily Pre-Operation Checklist should be completed by any operator or service and maintenance personnel prior to operating the machine.

Identified areas of concern should be addressed by qualified personnel only. References to procedures documented within this manual or additional sources of information have been provided where applicable.

For additional information, please contact TICO factory support. See “CONTACT TICO SUPPORT” on page 0-15.

Cab Interior Checks

- Clean all windows if necessary.
- Check all rear view mirrors. Adjust and clean if necessary.
- Check windshield wiper for proper operation.
- Check steering system for any binding. Make sure steering effort is smooth and tight.
- Check transmission shift lever for any binding.
- Check horn(s) for proper operation.
- Check boom control lever for proper operation.
- Check accelerator for proper operation; should operate smoothly and without any binding.

Exterior (Cab Down) Checks

- Check all fluid levels: engine oil, hydraulic oil, coolant, and diesel exhaust fluid (DEF).
- Inspect trailer electrical cable and trailer air lines for damage.
- Start engine and check transmission fluid level with parking brake applied and transmission shift selector in “neutral”.
- Check all lights for proper operation: headlights, turn signals, brake lights, hazard lights, and marker lights.
- Check and fill fuel tank.

Exterior (Cab Up) Checks

- Check cab hold down latch and the air suspension unit for proper latching.

Under Vehicle Checks

- None at this interval.

Chassis Checks

- Check tires for damage and proper inflation.
- Drain any moisture from air tanks.
- Check cab and frame for any structural damage or cracks.
- Ensure that all steps, walkways, and handholds are installed and in good working order.

Lubrication Checks

- Check fifth wheel grease.
EVERY 500 HOURS OF OPERATION

The following items are the preventative maintenance procedures to be completed after every 500 hours of operation on TICO Pro-Spotter terminal trucks. These procedures should only be completed by qualified service or maintenance personnel.

References to procedures documented within this manual or additional sources of information have been provided where applicable.

For additional information, please contact TICO factory support. See “CONTACT TICO SUPPORT” on page 0-15.

Cab Interior Checks
- Check operation of neutral start.
- Check operation of all gauges.
- Check low air buzzer and light.
- Check windshield wiper operation.
- Check windshield washer operation (if applicable).
- Check accelerator for free operation.
- Check horn(s) operation.
- Check air system for maximum 827 kPa (120 psi).
- Check air system for leak down.
- Check operation of backup alarm.
- Check heating, ventilation, and air conditioning (HVAC) system blower motor operation.
- Check HVAC system temperature control.
- Check HVAC system auxiliary fan(s) (if applicable).
- Check HVAC system A/C operation (if applicable).
- Check HVAC system defroster operation.
- Check operation of power take-off (PTO) control (if applicable).
- Check fifth wheel unlatch control.
- Check operation of boom.
- Check fire extinguisher charge (if applicable).
- Check seat belt operation.
- Check rear door operation.
- Check dome light operation.
- Check all glass and mirrors.
- Check operation of windows.

Exterior (Cab Down) Checks
- Check cab access steps and handles.
- Check rear door bushings.
- Check gladhand seals and trailer air lines.
- Check trailer light cord.
- Check headlights and marker lights.
- Check turn signals.
- Check strobe light (if applicable).
- Check spotlights.
- Check wiper blades.
- Check windshield washer fluid level.

Exterior (Cab Up) Checks
- Check operation of cab tilt pump.
- Check cab safety prop.
- Check cab suspension and latch.
- Check intake ducting for leaks.
- Check radiator for leaks.
- Check radiator mounts.
- Check coolant level and concentration.
- Check and adjust coolant additive (if applicable).
- Check coolant hoses and clamps.
- Check fan clutch for operation (if applicable).
- Check engine cooling fan for cracks.
- Check engine belt(s) and tensioner.
- Check engine and transmission for leaks.
- Drain fuel water separator.
- Change fuel filter and fuel water separator.
- Check air restriction gauge (if applicable).
- Check air filter. Change as necessary.
- Check air dryer desiccant. Change as necessary.
- Check exhaust system.
- Check transmission fluid level.
- Clean transmission breather.
Under Vehicle Checks
- Check steering gear.
- Check brake linings and drums.
- Check springs.
- Check power steering pump.
- Check hydraulic pump.
- Check starter mounting and connections.
- Check engine and transmission for leaks.
- Check engine and transmission mounts.
- Change engine oil and filter.
- Change transmission external filter.
- Check wheel seals for leaks.
- Check rear axle breather.
- Check differential for leaks.
- Check differential oil level.
- Check lift cylinders for leaks.
- Torque rear axle mounting bolts.

Chassis Checks
- Check front axle oil level (if applicable).
- Repack front wheel bearings (if applicable).
- Check battery cables and hold downs.
- Check batteries for cracking or acid leaks.
- Clean battery cable connections.
- Check battery box cover hold downs.
- Drain water from air tanks.
- Check and torque all wheel nuts.
- Check wheels.
- Check tire pressure, tread depth, and condition.
- Check rear axle planetary fluid level (if applicable).
- Inspect catwalk.
- Check frame for cracks.
- Check mud flaps and fenders (if applicable).
- Change hydraulic system filter.
- Check hydraulic fluid level.
- Change hydraulic fluid.
- Clean hydraulic tank vent.

Lubrication Checks
- Check and lubricate rear door bushings.
- Check and lubricate steering slip joint.
- Check and lubricate steering U-joints.
- Check and lubricate king pins and tie rod ends.
- Check and lubricate drag link.
- Check and lubricate slack adjusters.
- Check and lubricate spring pins and bushings.
- Check and lubricate driveline U-joints.
- Check and lubricate lower boom cylinder bearing.
- Add grease to auto lube reservoir (if applicable).
- Clean, check, adjust, and lubricate fifth wheel jaws.
- Check and lubricate fifth wheel top plate.
- Check and lubricate fifth wheel pivot pins.
- Check and lubricate boom pivot bearings.
- Check and lubricate upper boom cylinder bearing.
EVERY 1000 HOURS OF OPERATION

The following items are the preventative maintenance procedures to be completed after every 1000 hours of operation on TICO Pro-Spotter terminal trucks. These procedures should only be completed by qualified service or maintenance personnel.

References to procedures documented within this manual or additional sources of information have been provided where applicable.

For additional information, please contact TICO factory support. See “CONTACT TICO SUPPORT” on page 0-15.

NOTE
All items listed are in addition to those of the every 500 hours check section. For more information, see “EVERY 500 HOURS OF OPERATION” on page 2-3.

Cab Interior Checks
• No additional checks at this interval.

Exterior (Cab Down) Checks
• Clean heater and air conditioner filter (if applicable).

Exterior (Cab Up) Checks
• No additional checks at this interval.

Under Vehicle Checks
• No additional checks at this interval.

Chassis Checks
• No additional checks at this interval.

Lubrication Checks
• No additional checks at this interval.

EVERY 2000 HOURS OF OPERATION

The following items are the preventative maintenance procedures to be completed after every 2000 hours of operation on TICO Pro-Spotter terminal trucks. These procedures should only be completed by qualified service or maintenance personnel.

References to procedures documented within this manual or additional sources of information have been provided where applicable.

For additional information, please contact TICO factory support. See “CONTACT TICO SUPPORT” on page 0-15.

NOTE
All items listed are in addition to those of the every 500 and 1000 hours check sections. For more information, see “EVERY 500 HOURS OF OPERATION” on page 2-3 and “EVERY 1000 HOURS OF OPERATION” on page 2-5.

Cab Interior Checks
• No additional checks at this interval.

Exterior (Cab Down) Checks
• No additional checks at this interval.

Exterior (Cab Up) Checks
• Change engine coolant (except for optional extended life coolant).

Under Vehicle Checks
• Torque front axle mounting bolts.
• Torque king pin draw key nut(s).
• Change transmission fluid.
• Change differential oil.

Chassis Checks
• No additional checks at this interval.

Lubrication Checks
• No additional checks at this interval.
## RECOMMENDED LUBRICANTS AND CAPACITIES

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<thead>
<tr>
<th>System</th>
<th>Fluid Type</th>
<th>Capacity</th>
<th>Notes</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>(17.6 qt)</td>
<td></td>
</tr>
<tr>
<td>Transmission</td>
<td>Allison Approved TES 295® Automatic</td>
<td>27.4 L</td>
<td>Specification does not include external lines or cooler hoses.</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drive Axle Oil</td>
<td>85-140 (synthetic is optional)</td>
<td>39.7 L</td>
<td>See Axle Operator’s Manual.</td>
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<tr>
<td></td>
<td></td>
<td>(42 qt)</td>
<td></td>
</tr>
<tr>
<td>Hydraulic System</td>
<td>Dexron® III</td>
<td>68.1 L</td>
<td>Includes power steering.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(18 gal)</td>
<td></td>
</tr>
<tr>
<td>Chassis Fittings</td>
<td>Lithoplex RT #2</td>
<td>as needed</td>
<td></td>
</tr>
<tr>
<td>Auto Lube Pump Reservoir</td>
<td>Lithoplex RT #2</td>
<td>4 kg</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(8.8 lb)</td>
<td></td>
</tr>
<tr>
<td>Cab Tilt Pump</td>
<td>Dexron® III</td>
<td>1.9 L</td>
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<td></td>
<td>(0.5 gal)</td>
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## COOLING SYSTEM

### Recommendations

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<th>System</th>
<th>Fluid Type</th>
<th>Capacity</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling System</td>
<td>50/50 solution (ethylene glycol permanent antifreeze and softened water)</td>
<td>53 L (56 qt)</td>
<td>See Engine Operator’s Manual.</td>
</tr>
<tr>
<td>Radiator</td>
<td></td>
<td>37.9 L (40 qt)</td>
<td></td>
</tr>
</tbody>
</table>
**DIESEL EXHAUST FLUID (DEF)**

Requirements

<table>
<thead>
<tr>
<th>System</th>
<th>Fluid Type</th>
<th>Capacity</th>
<th>Notes</th>
</tr>
</thead>
</table>

⚠️ **CAUTION**

- Diesel exhaust fluid (DEF) contains urea. Do not get the substance in your eyes. In case of contact, immediately flush eyes with large amounts of water for a minimum of 15 minutes.
- Do not swallow internally. In the event the diesel exhaust fluid is ingested, contact a physician immediately.

_notice_

- Prevent possible machine aftertreatment system damage. Do not attempt to create diesel exhaust fluid (DEF) by mixing agricultural-grade urea with water. Agricultural-grade urea does not meet the required specifications.
- Prevent possible machine aftertreatment system damage. Do not add any chemicals/additives to the diesel exhaust fluid in an effort to prevent freezing.
DIESEL FUEL

Requirements

<table>
<thead>
<tr>
<th>Ultra-Low Sulfur Diesel Fuel (ASTM S-15)</th>
<th>Season</th>
<th>Cetain Number (minimum)</th>
<th>Sulfur Content (maximum)</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number 1D or 2D Blended (winterized)</td>
<td>Winter</td>
<td>45</td>
<td>0.15% 15 ppm</td>
<td>246 L</td>
</tr>
<tr>
<td>Number 2D</td>
<td>Summer</td>
<td>42</td>
<td></td>
<td>(65 gal)</td>
</tr>
</tbody>
</table>

NOTICE
Prevent possible engine damage. TICO Manufacturing requires that the operator of any TICO tractor comply with the engine manufacturer’s fuel requirements. Failure to comply with engine manufacturer’s fuel requirements may cause severe engine damage and void the warranty on the engine. Contact your TICO dealer if you did not receive an Engine Operator’s Manual with your new TICO tractor.

All TICO tractors come with an Engine Operator’s Manual provided by the engine manufacturer. This manual is for the specific engine in your vehicle. Refer to this Engine Operator’s Manual for additional fuel requirements. On road certified engines (Cummins ISB’s) require use of “ULTRA LOW SULFUR FUEL” ONLY.
LUBRICATION CHART

See Figures 2-1 and 2-2.

Figure 2-1: Chassis Lubrication

TPS-061
Figure 2-2: Boom and Fifth Wheel Lubrication
PRO-SPOTTER PREVENTATIVE MAINTENANCE

TICO Manufacturing Service Manual 2-11

TIRE PRESSURE

Recommendations

NOTE
Information provided is for the TICO Pro-Spotter standard tires. Other tire options may require different pressure specifications. See the tire manufacturer’s literature for additional information.

<table>
<thead>
<tr>
<th>Tire Size</th>
<th>Location</th>
<th>Pressure (maximum)</th>
</tr>
</thead>
<tbody>
<tr>
<td>11R X 22.5-16PR</td>
<td>Front</td>
<td>724 kPa (105 psi)</td>
</tr>
<tr>
<td></td>
<td>Rear</td>
<td>655 kPa (95 psi)</td>
</tr>
</tbody>
</table>

CALL OUT

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>LUBRICANT USED</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Coolant/Antifreeze</td>
<td>50/50 Ethyl-Glycol/Water</td>
</tr>
<tr>
<td>2 Engine Oil</td>
<td>SAE 15W-40 (See Engine Operator’s Manual)</td>
</tr>
<tr>
<td>3 Slack Adjuster Brake Cam Pivot</td>
<td>Lithoplex RT #2</td>
</tr>
<tr>
<td>4 Front Axle King Pin (2 used)</td>
<td>Lithoplex RT #2</td>
</tr>
<tr>
<td>5 Tie Rod End (2 used)</td>
<td>Lithoplex RT #2</td>
</tr>
<tr>
<td>7 Diesel Fuel</td>
<td>Ultra-Low Sulfur Diesel Fuel (See Engine Operator’s Manual)</td>
</tr>
<tr>
<td>8 Universal Joint (2 used)</td>
<td>Lithoplex RT #2</td>
</tr>
<tr>
<td>9 Rear Axle Differential</td>
<td>85-140 (synthetic is optional) (See Axle Operator’s Manual)</td>
</tr>
<tr>
<td>10 Drive Line Slip Yoke</td>
<td>Lithoplex RT #2</td>
</tr>
<tr>
<td>11 Spring Shackle Pin (4 used)</td>
<td>Lithoplex RT #2</td>
</tr>
<tr>
<td>12 Wheel Bearing (4 used)</td>
<td>85-140 (synthetic is optional) (See Axle Operator’s Manual)</td>
</tr>
<tr>
<td>13 Drag Link Pivot (2 used)</td>
<td>Lithoplex RT #2</td>
</tr>
<tr>
<td>14 Spring Guide Pin (2 used)</td>
<td>Lithoplex RT #2</td>
</tr>
<tr>
<td>15 Hydraulic Oil</td>
<td>Dexron® III</td>
</tr>
<tr>
<td>16 Power Steering</td>
<td>Dexron® III</td>
</tr>
<tr>
<td>17 Cab Lift Pump</td>
<td>Dexron® III</td>
</tr>
<tr>
<td>18 Steering Shaft U-Joint (2 used)</td>
<td>Lithoplex RT #2</td>
</tr>
<tr>
<td>19 Steering Slip Joint</td>
<td>Lithoplex RT #2</td>
</tr>
<tr>
<td>20 Boom Pivot</td>
<td>Lithoplex RT #2</td>
</tr>
<tr>
<td>21 Cylinder Bearing (4 used)</td>
<td>Lithoplex RT #2</td>
</tr>
<tr>
<td>22 Fifth Wheel Pivot</td>
<td>Lithoplex RT #2</td>
</tr>
<tr>
<td>23 Fifth Wheel Top Plate</td>
<td>Lithoplex RT #2</td>
</tr>
<tr>
<td>24 Fifth Wheel Jaw</td>
<td>Lithoplex RT #2</td>
</tr>
<tr>
<td>Section</td>
<td>Title</td>
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<tr>
<td>---------</td>
<td>-------</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td></td>
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<tr>
<td>ALTERNATOR</td>
<td></td>
</tr>
<tr>
<td>Removal</td>
<td></td>
</tr>
<tr>
<td>Inspection</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td></td>
</tr>
<tr>
<td>BATTERY</td>
<td></td>
</tr>
<tr>
<td>Cable Specifications</td>
<td></td>
</tr>
<tr>
<td>Removal</td>
<td></td>
</tr>
<tr>
<td>Inspection</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td></td>
</tr>
<tr>
<td>ELECTRICAL COMPONENT CHECKS</td>
<td></td>
</tr>
<tr>
<td>Alternator and Battery Fuse Check</td>
<td></td>
</tr>
<tr>
<td>Backup Alarm Check</td>
<td></td>
</tr>
<tr>
<td>Battery Voltage Check</td>
<td></td>
</tr>
<tr>
<td>Diode Check</td>
<td></td>
</tr>
<tr>
<td>K3 Solenoid Function Test</td>
<td></td>
</tr>
<tr>
<td>Relay Check</td>
<td></td>
</tr>
<tr>
<td>FUSE SPECIFICATIONS</td>
<td></td>
</tr>
<tr>
<td>POWER DISTRIBUTION CENTER</td>
<td></td>
</tr>
<tr>
<td>VEHICLE ELECTRICAL CENTER</td>
<td></td>
</tr>
<tr>
<td>WIRING DIAGRAMS AND SCHEMATICS</td>
<td></td>
</tr>
</tbody>
</table>
INTRODUCTION

The purpose of the ELECTRICAL SYSTEM section is to provide service and maintenance personnel with guidance on the proper procedures for servicing electrical equipment on TICO Pro-Spotter terminal trucks. The electrical system is made up of a 12-volt negative ground system, power distribution center (PDC), 160-amp Delco™ alternator, and a Delco™ starter. It also consists of switches, wiring, instruments, etc., which are required for the electrical system to perform its functions.

The TICO Pro-Spotter terminal trucks have been engineered for quick and efficient servicing while minimizing downtime.

For additional information, please contact TICO factory support. (See “CONTACT TICO SUPPORT” on page 0-15.)

ALTERNATOR

The TICO Pro-Spotter terminal tractor is equipped with a 160-amp Delco™ alternator. The alternator is located on the right front side of the Cummins™ engine. When servicing the alternator, follow these guidelines:

- Always disconnect the negative (-) battery cable when the engine is stopped and the alternator is not in use before servicing the part.
- Never disconnect or connect alternator wires while the batteries are connected or the alternator is in operation.
- Do not attempt to polarize the alternator or regulator.
- Never ground to any of the alternator terminals.
- Do not operate the alternator on an open circuit.

For additional information, reference the Cummins™ Operation and Maintenance Manual provided with your TICO tractor.

Removal

See Figure 3-1.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)
2. Raise cab.

**IMPORTANT**

Avoid damage to the alternator diodes. Never disconnect the battery while the alternator is in operation.

3. Disconnect batteries. (See “BATTERY” on page 3-3.)

4. Remove the drive belt (1) from the alternator pulley (2). See the Cummins™ Operation and Maintenance Manual.
5. Install identification tags and disconnect electrical connectors (3 and 4).
6. Remove mounting cap screw (5) and nut (6).
7. Remove cap screw (8), nut (9), and alternator (10).

**Inspection**

- Inspect alternator for damage. Repair or replace as needed.
- Inspect bolts, brackets, and wiring for damage. Replace as needed.
- Inspect pulley and belt for wear or cracks. Replace as needed.

**Installation**

Installation is the reverse of the removal procedure.

**IMPORTANT**

Avoid damage to the alternator diodes. Never reverse the polarity of the batteries.

- Verify the alternator wires are correctly connected before installing the batteries.

**Specifications**

<table>
<thead>
<tr>
<th>Component</th>
<th>Metric Value</th>
<th>English Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting Cap Screw—Toque Value</td>
<td>40 N·m</td>
<td>30 lb·ft</td>
</tr>
<tr>
<td>Cap Screw—Toque Value</td>
<td>24 N·m</td>
<td>212 lb·in</td>
</tr>
</tbody>
</table>
BATTERY

Standard TICO Pro-Spotter terminal trucks are equipped with two 12V 750 CCA 31-LHD threaded stud batteries. The batteries are contained in a battery enclosure mounted on the right side frame exterior of the tractor.

⚠️ CAUTION

- Prevent possible injury. Accidental contact between positive (+) battery terminal and ground can cause arcing and burns. Always disconnect the battery negative (-) cable first and battery positive (+) cable last. Connect battery positive (+) cable first and battery negative (-) cable last.
- Prevent possible injury. Battery gas is explosive. Keep flash and fire away from batteries.
- Prevent possible serious injury or burn. Sulfuric acid within the battery electrolyte is a hazardous material and direct contact should be avoided.

NOTE

Black and (-) are used to identify the negative battery terminal. Red and (+) are used to identify the positive battery terminal.

Cable Specifications

The specifications listed below must be followed when creating replacement battery cables.

1. The battery cable should have the following SAE specification:
   - Wire Type: SGX
   - SAE Specification: J1127
   - SAE Description: Low voltage battery cables
   - Covers wires larger than 6 gauge

2. Dimensions are shown in inches.
   - All dimensions shall be within 0.25" per foot.
   - Overall dimensions are from center of ring to center of ring.
   - Dimensions for cables with one ring are from center of ring to bare end of the cable.

3. Terminals are required to be machine crimped.
   - Refer to the terminal manufacturer’s documentation for proper wire strip length.
   - No loose strands are allowed.
   - Crimp must meet manufacturer’s minimum crimp specifications.
   - Terminal must be tin-plated brass.

4. After termination, terminals are required to be solder dipped.
   - Clean terminals of any oils or contaminants before being dipped.
   - Dipped terminals should be completely filled.
   - Remove excess solder to have a smooth terminal surface.

5. After terminals have cooled, cover with an adhesive filled heat-shrink tubing.

6. Install required cable protection.
   - A 300-degree loom must be sized to completely cover the cable.
   - Red battery cables require a red loom.
   - Black battery cables require a black loom.
   - If a braid is required, the braid must be Nylon 6 or an equivalent.

7. The completed assembly must have a part number label attached to one end of the cable.
   - Label will include a part number, revision level, and date of manufacture.

8. For instances where there are two battery cables together as a set, use the following rules:
   - Apply the requirements in steps 1—7 to each individual cable.
   - Use bonding tape to assemble cables together.
   - Only one part number label is required per set.
Removal

See Figures 3-2 and 3-3.

NOTE

If the machine is out of use for more than 30 days, remove the batteries. Store the batteries in a dry, cool, well-ventilated area and out of the reach of children and pets.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

2. Unlatch the handles (1) to open the battery box (2).

3. Remove rubber mat (3).

4. Remove nuts (4), black battery jumper cable (5), and busbar (6) from negative (-) battery terminals.

5. Remove nuts (4), red battery jumper cable (7), and busbar (6) from positive (+) battery terminals.

6. Remove nuts (8), washers (9), and J-bolts (10).

7. Remove batteries (12) and battery covers (11).

Inspection

- Inspect cables and brackets for damage. Replace as needed.
- Clean battery and cables of dirt and corrosion using an approved battery-cleaning solution.
- Check the water level and add water as needed.

IMPORTANT

To prevent damage to the battery and other components, avoid a high charging rate on a fully charged battery.
- Verify the battery is fully charged and properly working.

Installation

Installation is the reverse of the removal procedure.
- Connect battery positive (+) cable first and battery negative (-) cable last.
- Apply an anti-corrosion solution to battery terminals.
- Properly tighten all cables to the battery terminals to prevent weak electrical connections.
**ELECTRICAL COMPONENT CHECKS**

The following checks are performed on electrical components throughout the tractor. Wiring diagrams needed to aid these checks can be found by contacting TICO support. (See “CONTACT TICO SUPPORT” on page 0-15.)

Prior to troubleshooting any electrical component, perform the following checks:
- Ensure the battery has full charge and cables are securely mounted to battery terminals.
- Inspect relays and circuit breakers.
- Check for broken, loose, or corroded wires and connectors.
- Study the appropriate wiring diagram.

**Alternator and Battery Fuse Check**

1. Remove fuse.
2. Measure the continuity of the terminals of the fuse.
   - Is continuity measured?
     - **YES**  Fuse is good. Check wiring.
     - **NO**  Replace the fuse.

**Backup Alarm Check**

See Figure 3-4.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)
2. Disconnect the wire harness electrical connector (1) from the backup alarm.
3. Connect a multimeter to pin B (3) of the wire harness electrical connector and to the frame ground.
4. Turn key switch to the ON position.
   - Is battery voltage measured?
     - **YES**  Replace backup alarm.
     - **NO**  Check fuses and wiring.
5. With the key switch still in the ON position, measure the continuity between pin A (2) of the wire harness electrical connector and the frame ground.
   - Is continuity measured?
     - **YES**  Replace backup alarm.
     - **NO**  Backup alarm is good. Check wiring.

**Battery Voltage Check**

See Figure 3-5.

1. Turn key switch to the OFF position.
2. Connect a multimeter to the negative (-) battery terminal (5) that is grounded to the frame and the positive (+) battery terminal (4) that is connected to the tractor.
3. Measure the battery (6) voltage.
   - Is the voltage between 12V and 14V?
     - **YES**  Batteries are good.
     - **NO**  Batteries are not fully charged. Charge the batteries.

---

**Figure 3-4: Back Up Alarm Connector (wire harness side)**

1. Electrical Connector 3. Pin B
2. Pin A

**Figure 3-5: Battery Voltage Check**

4. Positive (+) Battery Terminal
5. Negative (-) Battery Terminal
6. Battery (2 used)

---

**Figure 3-5: Batteries are good. Check wiring.**
Diode Check
See Figure 3-6.

1. Remove the diode.
2. Test the diode (11) using the diode test function (8) on the multimeter (7).

Does the multimeter beep?
YES Reverse the multimeter probes (9 and 10) and test the diode again.
NO Reverse the multimeter probes and test the diode again.

Does the multimeter beep?
YES The multimeter beeped on the second test but not on the first test. The diode is good.
YES The multimeter beeped on both tests. Replace the diode.
NO The multimeter did not beep on the second test but did beep on the first test. The diode is good.
NO The multimeter did not beep on either test. Replace the diode.

K3 Solenoid Function Test
See Figure 3-7.

1. Turn key switch to the ON position.
2. Use a voltmeter to check the voltage at terminal 85 and terminal 86 of the K3 solenoid.

Does the voltage measure 12 volts?
YES Solenoid is functional.
NO Replace the K3 solenoid.

3. Use a voltmeter to check the voltage at terminal 30 to the ground busbar.

Does the voltage measure 12 volts?
YES Solenoid is functional.
NO Replace the K3 solenoid.

4. Use a voltmeter to check the voltage at terminal 87 to the ground busbar.

Does the voltage measure 12 volts?
YES Solenoid is functional.
NO Replace the K3 solenoid.

---

Figure 3-6: Diode Test

Figure 3-7: K3 Solenoid
Relay Check
See Figure 3-8.

Figure 3-8: Relay Terminals

1. Stop the engine and remove the relay from the tractor.
2. Measure the continuity between terminal 30 and terminal 87a.
   Is continuity measured?
   YES Relay is good. Check wiring harness.
   NO Replace relay.
3. Connect battery voltage to terminal 86 and ground terminal 85.
   Does the relay click?
   YES Relay is good. Check wiring harness.
   NO Replace relay.
4. With terminal 86 still connected to the battery and terminal 85 still grounded, measure the continuity between terminal 30 and terminal 87.
   Is continuity measured?
   YES Relay is good. Check wiring harness.
   NO Replace relay.
FUSE SPECIFICATIONS

See Figures 3-9 and 3-10.
The TICO Pro-Spotter is equipped with an easily accessible fuse panel. This panel is located on the right side of the dash and uses blade-type fuses. The fuse decal is located to the right of the fuse block on the cover of the heat assembly. This decal is to be used as a reference to identify the fuses.

For additional information, please contact TICO factory support. (See “CONTACT TICO SUPPORT” on page 0-15.)

**IMPORTANT**

Install fuse with correct amperage rating to prevent electrical system damage from overload.

### Figure 3-9: Fuse Block Location

1. Auxiliary Fuse Panel
2. Electrical Supply Board
3. Fuse Block Cover
4. Fuse Block
5. Dash
6. Cover

### Figure 3-10: Fuse Block

<table>
<thead>
<tr>
<th>Fuse</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>Accessory 20A Fuse</td>
</tr>
<tr>
<td>F2</td>
<td>AM/FM Radio 10A Fuse</td>
</tr>
<tr>
<td>F3</td>
<td>Computer 10A Fuse</td>
</tr>
<tr>
<td>F4</td>
<td>Spare 20A Fuse</td>
</tr>
<tr>
<td>F5</td>
<td>Lube System 10A Fuse</td>
</tr>
<tr>
<td>F6</td>
<td>Daytime Running Lights (DRL) Battery 10A Fuse</td>
</tr>
<tr>
<td>F7</td>
<td>Computer 10A Fuse</td>
</tr>
<tr>
<td>F8</td>
<td>AM/FM Radio 10A Fuse</td>
</tr>
<tr>
<td>F9</td>
<td>Camera/Outlet 10A Fuse</td>
</tr>
<tr>
<td>F10</td>
<td>Lube System 10A Fuse</td>
</tr>
<tr>
<td>F11</td>
<td>Door/HVAC Actuators 10A Fuse</td>
</tr>
<tr>
<td>F12</td>
<td>Dome/Fan 20A Fuse</td>
</tr>
<tr>
<td>F13</td>
<td>HVAC Blower 30A Fuse</td>
</tr>
<tr>
<td>F14</td>
<td>Power Window 25A Fuse</td>
</tr>
<tr>
<td>F15</td>
<td>Accessory 20A Fuse</td>
</tr>
<tr>
<td>F16</td>
<td>Work Lights-Outboard 20A Fuse</td>
</tr>
<tr>
<td>F17</td>
<td>Work Lights-Inboard 20A Fuse</td>
</tr>
<tr>
<td>F18</td>
<td>Transmission Control Module (TCM) 5A Fuse</td>
</tr>
<tr>
<td>F19</td>
<td>Engine Control Unit (ECU) 5A Fuse</td>
</tr>
<tr>
<td>F20</td>
<td>Antilock Brake System (ABS) Ignition 5A Fuse</td>
</tr>
<tr>
<td>F21</td>
<td>Strobe 10A Fuse</td>
</tr>
<tr>
<td>F22</td>
<td>Boom 10A Fuse</td>
</tr>
<tr>
<td>F23</td>
<td>Gauges 10A Fuse</td>
</tr>
<tr>
<td>F24</td>
<td>Mirrors 20A Fuse</td>
</tr>
</tbody>
</table>
POWER DISTRIBUTION CENTER

See Figures 3-11 and 3-12.
The TICO Pro-Spotter is equipped with an easily accessible power distribution center (PDC). The PDC box is located on the exterior right side of the tractor next to the battery enclosure box. This placement allows for ease of handling during servicing, while minimizing downtime.

For additional information, please contact TICO factory support. (See “CONTACT TICO SUPPORT” on page 0-15.)

VEHICLE ELECTRICAL CENTER

See Figures 3-13, 3-14, and 3-15.
The TICO Pro-Spotter is equipped with an easily accessible vehicle electrical center (VEC). The VEC consists of two electrical modules located behind the driver front access panel. This placement allows for ease of handling during servicing, while minimizing downtime. These modules are also referred to as the cab power distribution center (CPDC).

For additional information, please contact TICO factory support. (See “CONTACT TICO SUPPORT” on page 0-15.)

---

**Figure 3-11: Power Distribution Center (PDC) Location**

**Figure 3-12: Power Distribution Center (PDC) Chassis Mounted**

**Figure 3-13: Vehicle Electrical Center Modules**

1. Power Distribution Center (PDC)
2. 50A Circuit Breaker
3. Fuse Box
4. Solenoid
5. Cab Battery 250A Fuse
6. Intake Heater 250A Fuse
7. Lift Motor 125A Fuse
8. Spare 125A Fuse
9. Ignition 120A Circuit Breaker
10. Electrical Connector
11. Ignition Solenoid
<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
<th>Part Number</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vehicle Electrical Center Module 1 (VEC1)</td>
<td>VEC1-F1</td>
<td>Flasher 20A Fuse</td>
</tr>
<tr>
<td>2</td>
<td>VEC1-F2 Taillight 20A Fuse</td>
<td>VEC1-F6</td>
<td>Fan Clutch 10A Fuse</td>
</tr>
<tr>
<td>3</td>
<td>VEC1-F3 Headlight 20A Fuse</td>
<td>VEC1-F9</td>
<td>Horn 10A Fuse</td>
</tr>
<tr>
<td>4</td>
<td>VEC1-F1 Taillight 20A Fuse</td>
<td>VEC1-F7</td>
<td>Fan Clutch 10A Fuse</td>
</tr>
<tr>
<td>5</td>
<td>VEC1-F5 Stop Lamp 10A Fuse</td>
<td>VEC1-F14</td>
<td>Reverse 2 Relay</td>
</tr>
<tr>
<td>6</td>
<td>VEC1-F6 Spare 10A Fuse</td>
<td>VEC1-F10</td>
<td>Trailer Lights 10A Fuse</td>
</tr>
<tr>
<td>7</td>
<td>VEC1-F8 Spare 10A Fuse</td>
<td>VEC1-F12</td>
<td>Reverse 20A Fuse</td>
</tr>
<tr>
<td>8</td>
<td>VEC1-F9 Horn 10A Fuse</td>
<td>VEC1-F13</td>
<td>Reverse 20A Fuse</td>
</tr>
<tr>
<td>9</td>
<td>VEC1-F11 Reverse 20A Fuse</td>
<td>VEC1-F14</td>
<td>Spare 10A Fuse</td>
</tr>
<tr>
<td>10</td>
<td>VEC1-F10 Trailer Lights 10A Fuse</td>
<td>VEC1-R1</td>
<td>Reverse Relay</td>
</tr>
<tr>
<td>11</td>
<td>VEC1-R2 Fan Clutch 2 Relay</td>
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<td>Horn Relay</td>
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</tr>
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**Figure 3-14: Vehicle Electrical Center Module 1 (VEC1)**
### Wiring Diagrams and Schematics

Wiring diagrams and electrical schematics are used to aid in checking wire circuits and electrical troubleshooting. These diagrams and electrical schematics are frequently updated to provide the best information possible when servicing a TICO Pro-Spotter terminal tractor. To view the most recent diagrams and schematics, contact TICO support. (See “CONTACT TICO SUPPORT” on page 0-15.)

<table>
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<td>Wiper 30A Fuse</td>
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**Figure 3-15: Vehicle Electrical Center Module 2 (VEC2)**
## Section 4

### ENGINE

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INTRODUCTION

The purpose of the ENGINE section is to provide service and maintenance personnel with guidance on the proper procedures for servicing the Cummins™ engine and its related components, including the air intake and cooling systems on TICO Pro-Spotter terminal trucks.

The TICO Pro-Spotter terminal trucks have been engineered for quick and efficient servicing, while minimizing down time. The external location for many of the engine related parts allow for easy access.

For additional information, please contact TICO factory support. (See “CONTACT TICO SUPPORT” on page 0-15.)

CHECK FLUID LEVEL

Engine Oil Level

See Figure 4-1.

**IMPORTANT**

Avoid damage to the engine. Never operate the engine with the oil level below the “L” (Low) mark or above the “H” (High) mark.

**NOTES**

- Wait at least 15 minutes after shutting off the engine to allow time for the oil to drain into the oil pan before checking the engine oil.
- The vehicle must be level when checking the oil level to make sure the measurement is correct.

Coolant Level

See Figure 4-2.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

2. Ensure the coolant level is up to the sight glass (1) on the surge tank (2).

**CAUTION**

To avoid personal injury from escaping heated coolant under pressure, allow engine to reach a temperature of 49°C (120°F) or below. Relieve pressure from the coolant system by slowly removing the surge tank cap.

3. Remove surge tank cap (3) if necessary.

4. Using a syringe type tester, ensure coolant is protected to at least -32°C (-25°F).

**IMPORTANT**

- Avoid damage to engine castings. Do not add cold coolant to a hot engine. Allow engine to cool to 49°C (120°F) before adding coolant.
- Avoid coolant system plugging and engine overheat caused by inadequate coolant flow. Never use a sealing additive to stop leaks in the coolant system.

5. Add coolant if necessary.

6. Ensure the coolant level is up to the sight glass on the surge tank.

7. Install surge tank cap.
AIR INTAKE SYSTEM

Removal

See Figures 4-3, 4-4, and 4-5.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)
2. Raise the cab.
3. Disconnect battery cables. (See “BATTERY” on page 3-3.)

4. Install identification tags and disconnect electrical connector (3).
5. Remove filter gauge (1) if necessary.
6. Loosen hose clamps (5) and remove hump hose (4) and blower-to-hump hose tube (2).

7. Remove nuts (7), washers (8), and saddle clamp (9).
8. Loosen hose clamps (5 and 11) and remove hump hose (10) and air cleaner-to-hump hose tube (6).

Inspection

1. Inspect air filter. (See “AIR FILTER” on page 4-5.)
2. Inspect the intake system for cracked silicone hoses, loose clamps, or punctures, which can allow dirt and debris to enter the engine.
3. Inspect the air inlet piping including all joints, clamps, hoses, and connections to ensure they are tight.
4. Verify no holes or tears are present in the system.
5. Inspect air intake pipe supports to ensure no broken or loose supports exist.
6. Repair or replace parts as necessary.

Installation

Installation is reverse of the removal procedure.
AIR FILTER

Removal
See Figures 4-6 and 4-7.
1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)
2. Unfasten latches (1) and remove cover.
3. Remove air filter (2).
4. Remove dust cap (3) and dispose of debris.
5. Repair or replace components as necessary.

Inspection
See Figure 4-8.

- Replace air filter when yellow indicator on the filter gauge (4) reaches red line.
- Check filter for wear or damage. Replace parts found to be unserviceable.
- Clean all parts of dirt and debris.

Installation
Installation is reverse of the removal procedure.

NOTE
Filter gauge should be reset when a new filter is installed.
- Install new filter if necessary and reset filter gauge.
**CHARGE AIR COOLER**

**Removal**

See Figures 4-9, 4-10, and 4-11.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)
2. Raise cab.
3. Remove brush guard. (See “FRONT COVERS AND GUARDS” on page 14-3.)

Figure 4-9: Charge Air Cooler (CAC) Removal

4. Remove U-bolt (3), bracket (7), washers (5), and lock nuts (6).
5. Disconnect tubes (4 and 8). Close all openings using caps and plugs.

**NOTE**

Condenser lines do not need to be removed.

6. Remove cap screws (22) and covers (13).

7. Remove cap screws (14), washers (15), and lock nuts (16) and set condenser (17) aside.
8. Remove cap screws (20), washers (19), lock nuts (18), and shield (21).
Figure 4-11: Charge Air Cooler Cap Screws

9. Remove cap screws (23) and charge air cooler (CAC) (25).

Inspection

- Check CAC for cracks, holes, or other damage. Replace parts found to be unserviceable.
- Inspect CAC piping, hoses, fittings, and clamps for leaks, holes, cracks, and loose connections. Replace parts found to be unserviceable.
- Clean all parts of dirt and debris.

Installation

Installation is reverse of the removal procedure.

COOLING FAN

Removal

See Figures 4-12, 4-13, and 4-14.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

2. Raise the cab.

3. Disconnect battery cables. (See “BATTERY” on page 3-3.)

4. Remove U-bolt (3), bracket (7), washers (5), and lock nuts (6).

5. Disconnect tubes (4 and 8). Close all openings using caps and plugs.
NOTE
A suitable container is needed for draining coolant from the upper radiator hose. The surge tank will also drain at the radiator inlet port.

6. Loosen hose clamp (10). Disconnect upper radiator hose (9) and allow coolant to drain. Close all openings using caps and plugs.

7. Remove cap screws (11), washers (12 and 14), lock washer (15), lock nuts (13), and upper fan shroud (16).

8. Remove cap screws (17), lock washers (18), washers (19), and cooling fan (20).

Inspection
- Check for cracks, loose rivets, and bent or loose blades. Replace cooling fan if damaged.
- Check that the cooling fan is securely mounted and tighten any loose cap screws.
- Clean all parts of dirt and debris.

Installation
Installation is reverse of the removal procedure.
DIESEL EXHAUST FLUID (DEF) TANK

Removal

See Figures 4-15 and 4-16.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)
2. Disconnect battery cables. (See “BATTERY” on page 3-3.)

Figure 4-15: Diesel Exhaust Fluid (DEF) Tank Cover

3. Remove lock nuts (1), washers (2), and bolts (3).
4. Remove brackets (4) and diesel exhaust fluid (DEF) tank cover (5).

Figure 4-16: DEF Tank Removal

5. Install identification tags and disconnect electrical connector (11).
6. Install identification tags and disconnect hoses (9 and 10). Close all openings using caps and plugs.
7. Install identification tags and disconnect DEF lines (7 and 8). Close all openings using caps and plugs.
8. Remove DEF tank (6).
9. Properly drain or dispose of DEF.

Inspection

• Check hoses, lines, fittings, and clamps for wear or damage. Replace parts found to be unserviceable.
• Inspect DEF tank and filler cap for damage or signs of leakage. Replace parts found to be unserviceable.
• Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.
• Check electrical connectors and wire harness for wear or damage. Replace parts found to be unserviceable.
• Clean all parts of dirt and debris.

Installation

Installation is reverse of the removal procedure.

IMPORTANT

Avoid damage to the aftertreatment system. Do not add any other fluid besides what is specified to the DEF tank.

• Fill the DEF tank with recommended fluid type. See the Cummins™ Operation and Maintenance Manual for more information.
FUEL FILTER

Removal
See Figure 4-17.
1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)
2. Disconnect battery cables. (See “BATTERY” on page 3-3.)

3. Install identification tags and disconnect electrical connector (1).

4. Install identification tags and disconnect hoses (2 and 3). Close all openings using caps and plugs.

NOTE
A SAE 1-in wrench may be used to loosen the fuel filter (8).

5. Remove fuel filter (8).

6. Remove cap screws (4), washers (5), lock nuts (6), and filter head (7).

7. Repair or replace components as necessary.

Inspection
- Inspect filter head for damage or signs of leakage. Replace parts found to be unserviceable.
- Check hoses, fittings, and clamps for wear or damage. Replace parts found to be unserviceable.
- Check wiring harness for wear or damage. Replace parts found to be unserviceable.
- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.
- Clean all parts of dirt and debris.

Installation
Installation is reverse of the removal procedure.
- Replace all O-ring seals and apply an approved lubricant before installation.

IMPORTANT
Avoid damage to fuel system components. Do not pour fuel directly in the center and bypass the filters. This allows unfiltered fuel to enter the system.
- Fill new fuel filter with clean fuel before installation.
- Install new fuel filter and tighten to specification.

NOTE
Priming may need to be repeated until engine starts. Dry filters may need approximately 140 stokes. Pre-filled filters may need 20 to 60 strokes.
- Use the priming hand pump to prime the fuel system.
- Operate the engine and check for leaks.

Specifications

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Figure 4-17: Fuel Filter

1 Electrical Connector
2 Fuel Tank-to-Fuel Filter Hose
3 Fuel Filter-to-Engine Hose
4 Cap Screw (2 used)
5 Washer (4 used)
6 Lock Nut (2 used)
7 Filter Head
8 Fuel Filter
9 Hose Clamp (2 used)
FUEL TANK

Removal
See Figures 4-18 and 4-19.
1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)
2. Disconnect battery cables. (See “BATTERY” on page 3-3.)

3. Install identification tags and disconnect electrical connector (1).
4. Install identification tags and disconnect hoses (2, 3, and 4). Close all openings using caps and plugs.

5. Remove plug (9) to drain fuel tank.

Installation
Installation is reverse of the removal procedure.

6. Remove grates. (See “LEFT COVERS AND GUARDS” on page 14-8.)
7. Remove nuts (7) and straps (8).
8. Remove fuel tank (6).
9. Repair or replace components as necessary.

Inspection
- Check hoses, fittings, and clamps for wear or damage. Replace parts found to be unserviceable.
- Inspect fuel tank and filler cap for damage or signs of leakage. Repair or replace parts found to be unserviceable.
- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.
- Check wiring harness for wear or damage. Replace parts found to be unserviceable.
- Clean all parts of dirt and debris.

Specifications

| Fuel Tank—Capacity | 246 L  
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Figure 4-19: Fuel Tank

6 Fuel Tank 8 Strap (2 used)
7 Nut (2 used) 9 Plug

Figure 4-18: Fuel Tank Connections

1 Electrical Connector 4 Fuel Tank-to-Fuel Filter Hose
2 Fuel Tank-to-Engine Hose 5 Hose Clamp (3 used)
3 Overflow Hose 6 Fuel Tank

ULTRA LOW-SULFUR DIESEL FUEL ONLY

TPS-045

TPS-044
DRAINING FUEL/WATER SEPARATOR

See Figure 4-20.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

2. Open drain valve (2).

3. Drain the fuel/water separator into a suitable container until the fuel turns clear.

4. Properly dispose of waste.

**IMPORTANT**

Avoid damage to the valve threads. Do not overtighten the drain valve.

5. Hand tighten the drain valve until it is securely closed.

**NOTE**

*Priming may need to be repeated until engine starts. Dry filters may need approximately 140 stokes. Pre-filled filters may need 20 to 60 strokes.*

6. Turn the priming hand pump (3) counterclockwise and begin pumping until resistance is felt.

7. Lock the priming hand pump.

8. Operate the engine and check for leaks.

---

RADIATOR

**Removal**

See Figures 4-21 and 4-22.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

2. Disconnect battery cables. (See “BATTERY” on page 3-3.)

**CAUTION**

Avoid injury and serious burns from escaping cooling system fluid under pressure. Stop engine and allow cooling system temperature to reach 50°C (120°F) or below. Slowly loosen filler cap to relieve pressure.

3. Drain cooling system into a suitable container. (See “Cooling System Draining” on page 4-14.)

**Specifications**

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<tr>
<td><strong>Radiator—Capacity</strong></td>
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---

1 Fuel Filter 2 Drain Valve 3 Priming Hand Pump
4. Remove charge air cooler (CAC) (11). (See "CHARGE AIR COOLER" on page 4-6.)

5. Remove transmission cooler (12). (See "TRANSMISSION COOLER" on page 5-4.)

6. Loosen hose clamp (1) and disconnect upper radiator hose (2). Close all openings using caps and plugs.

7. Remove cap screws (3), washers (4 and 6), lock washer (7), lock nuts (5), upper fan shroud (8), and lower fan shroud (9).

8. Remove rods (14), rubber mounts (15), washers (16), jamnuts (17), and lock nuts (18).

9. Remove lock nuts (19), washers (20), and isolators (21).

10. Remove radiator (22).

11. Repair or replace components as necessary.

**Inspection**

- Check radiator for cracks, broken fins, or other damage. Replace parts found to be unserviceable.
- Inspect radiator piping, hoses, fittings, and clamps for leaks, holes, cracks, and loose connections. Replace parts found to be unserviceable.
- Clean all parts of dirt and debris.

**Installation**

Installation is reverse of the removal procedure.
COOLING SYSTEM MAINTENANCE

Cooling System Draining

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

   ![Figure 4-23: Surge Tank Filler Cap](TPS-019)

   1 Filler Cap 2 Surge Tank

   **CAUTION**

   - To avoid personal injury from escaping heated coolant under pressure, allow engine to reach a temperature of 49°C (120°F) or below. Relieve pressure from the coolant system by slowly removing the radiator cap.
   - To prevent skin disorders and bodily injury, avoid excessive skin contact with used antifreeze. Wash thoroughly after contact. Keep out of reach of children.

2. Remove filler cap (1) on surge tank (2).

   ![Figure 4-24: Radiator Drain Valve](TPS-058)

   3 Lower Radiator Hose 4 Drain Valve 5 Radiator

   **CAUTION**

   - Position a suitable container below the drain valve (4) and lower radiator hose (3).
   - Open drain valve.
   - Disconnect lower radiator hose.
   - Properly dispose of coolant.

   ![Figure 4-24: Radiator Drain Valve](TPS-058)

   3 Lower Radiator Hose 5 Radiator

   **CAUTION**

   - Avoid personal injury. Do not stand near the surge tank or radiator while operating the engine with the filler cap off.
   - To prevent skin disorders and bodily injury, avoid excessive skin contact with used antifreeze. Wash thoroughly after contact. Keep out of reach of children.

3. Position a suitable container below the drain valve (4) and lower radiator hose (3).

Specifications

| Cooling System—Capacity | 53 L 14 gal |

4. Open drain valve.

5. Disconnect lower radiator hose.

6. Properly dispose of coolant.

7. Check cooling system for leaks and damaged hoses and loose or damaged hose clamps.

8. Close drain valve and connect lower radiator hose.

Cooling System Flushing

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

   ![Figure 4-24: Radiator Drain Valve](TPS-058)

   3 Lower Radiator Hose 5 Radiator

   **IMPORTANT**

   Avoid serious engine damage and prevent air locks. Properly vent air from the engine coolant passages during the fill process.

   **NOTES**

   Adequate venting is provided for a fill rate of 19 L (5 gal) per minute.

   3. Fill the system with a mixture of sodium carbonate and water (or a commercially available equivalent).

   4. Wait for 2 to 3 minutes to allow the system to naturally vent air and coolant levels to stabilize.

   5. Add plain water to the system to bring the level back to FULL.

   **CAUTION**

   - To avoid personal injury. Do not stand near the surge tank or radiator while operating the engine with the filler cap off.
   - To prevent skin disorders and bodily injury, avoid excessive skin contact with used antifreeze. Wash thoroughly after contact. Keep out of reach of children.
**IMPORTANT**

Avoid engine damage by cavitation of the water pump and localized boiling. Do not operate the engine with the pressure cap off at temperatures above 93°C (200°F).

**NOTES**

- Do not install the filler cap. The engine is to be operated without the cap for this process.
- Turn cab heater switches to HIGH and blower switches to ON to allow maximum coolant flow throughout the heater core.

6. With the filler cap removed, operate engine at LOW IDLE for 2 minutes.
7. Shut off engine and add plain water to the system to bring the level back to FULL.
8. With the filler cap removed, operate engine at HIGH IDLE until thermostat opens. Then allow engine to return to LOW IDLE for 2 minutes.
9. Shut off engine and add coolant to the system to bring the level back to FULL.
10. Install filler cap and operate engine for 1 hour with the coolant temperature above 80°C (176°F).
11. Shut off engine.
12. Drain cooling system. (See “COOLING SYSTEM MAINTENANCE” on page 4-14.)
13. Fill the cooling system with clean water.
14. Repeat steps 4 through 8.
15. Shut off engine.
16. Drain water from cooling system. (See “COOLING SYSTEM MAINTENANCE” on page 4-14.)
17. Fill the cooling system. (See “Cooling System Filling” on page 4-15.)

**Cooling System Filling**

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)
2. Drain cooling system. (See “Cooling System Draining” on page 4-14.)

**IMPORTANT**

- Avoid serious engine damage and prevent air locks. Properly vent air from the engine coolant passages during the fill process.
- Avoid system damage and corrosion. Never use water alone as a coolant.

**NOTES**

Adequate venting is provided for a fill rate of 19 L (5 gal) per minute.
SURGE TANK

Removal
1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)
2. Disconnect battery cables. (See “BATTERY” on page 3-3.)

WARNING
Avoid injury and serious burns from escaping cooling system fluid under pressure. Stop engine and allow cooling system temperature to reach 50°C (120°F) or below. Slowly loosen filler cap to relieve pressure.

3. Drain cooling system into a suitable container. (See “Cooling System Draining” on page 4-14.)
4. Disconnect electrical connector (2).
5. Install identification tags and disconnect hoses (3, 4, 10, and 12). Close all openings using caps and plugs.
6. Remove lock nuts (7), washers (6), and cap screws (8).
7. Remove surge tank (1).

Inspection
- Check hoses, fittings, and clamps for wear or damage. Replace parts found to be unserviceable.
- Inspect surge tank and filler cap for damage or signs of leakage. Repair or replace parts found to be unserviceable.
- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.
- Check wiring harness for wear or damage. Replace parts found to be unserviceable.
- Clean all parts of dirt and debris.

Installation
Installation is reverse of the removal procedure.
- Properly fill the cooling system with recommended coolant. See the Cummins™ Operation and Maintenance Manual for more information.
- Operate the engine and check for leaks.

Specifications
Cooling System—Capacity

<table>
<thead>
<tr>
<th>Description</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surge Tank</td>
<td>TPS-019</td>
</tr>
<tr>
<td>Electrical Connector</td>
<td>TPS-019</td>
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<tr>
<td>Engine-to-Surge Tank Hose</td>
<td>TPS-019</td>
</tr>
<tr>
<td>Overflow Hose</td>
<td>TPS-019</td>
</tr>
<tr>
<td>Filler Cap</td>
<td>TPS-019</td>
</tr>
<tr>
<td>Washer (4 used)</td>
<td>TPS-019</td>
</tr>
<tr>
<td>Lock Nut (4 used)</td>
<td>TPS-019</td>
</tr>
<tr>
<td>Cap Screw (4 used)</td>
<td>TPS-019</td>
</tr>
<tr>
<td>Hose Clamp (2 used)</td>
<td>TPS-019</td>
</tr>
<tr>
<td>Radiator-to-Surge Tank Hose</td>
<td>TPS-019</td>
</tr>
<tr>
<td>Hose Clamp</td>
<td>TPS-019</td>
</tr>
<tr>
<td>Surge Tank-to-Frame Coupler</td>
<td>TPS-019</td>
</tr>
<tr>
<td>Hose</td>
<td>TPS-019</td>
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</table>

Figure 4-25: Surge Tank
# TRANSmission

<table>
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<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
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<td>CHECK FLUID LEVEL</td>
<td>5-2</td>
</tr>
<tr>
<td>Transmission Fluid</td>
<td>5-2</td>
</tr>
<tr>
<td>TRANSMISSION COOLER</td>
<td>5-4</td>
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<tr>
<td>Removal</td>
<td>5-4</td>
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<tr>
<td>Inspection</td>
<td>5-4</td>
</tr>
<tr>
<td>Installation</td>
<td>5-4</td>
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<tr>
<td>TRANSMISSION FILTER</td>
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<td>Removal</td>
<td>5-5</td>
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<tr>
<td>Inspection</td>
<td>5-5</td>
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<tr>
<td>Installation</td>
<td>5-6</td>
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<tr>
<td>TRANSMISSION FLUID MAINTENANCE</td>
<td>5-6</td>
</tr>
<tr>
<td>Transmission Fluid Draining</td>
<td>5-6</td>
</tr>
<tr>
<td>Transmission Fluid Filling</td>
<td>5-7</td>
</tr>
</tbody>
</table>
INTRODUCTION

Standard TICO tractors are equipped with an Allison Transmission® fully automatic transmission. These heavy-duty transmissions are designed for stop and go operation.

NOTE

An Allison Transmission® operator’s manual is provided with every TICO tractor. This manual provides important information on operation of the Allison Transmissions®. For additional service and maintenance information, see the Allison Transmission® operator’s manual.

CHECK FLUID LEVEL

Transmission Fluid

Periodic transmission fluid level checks help prevent mechanical failure of a vehicle or transmission component. Periodic checks also help detect the following conditions:

- Cooler failures
- Fluid contamination
- Fluid leaks
- Fluid overfill
- Fluid underfill
- Incorrect fluid used at last servicing

Transmission fluid level checks may be completed manually by checking the dipstick (1) or electronically via the transmission gear selector.

Transmission fluid level is dependent upon fluid operating temperatures due to thermal expansion. Procedures vary depending upon transmission fluid temperature.

Manual Check—Cold

See Figures 5-1 and 5-2.

The cold check band (2) on the dipstick (1) verifies that the transmission has adequate fluid for start-up and operation until it can be checked at the operating (hot) temperature. Fluid levels for continued operation should not be adjusted based on a cold check alone. A cold check is the most accurate with fluid temperatures of 16°—49°C (61°—120°F).

1. Park the tractor on a level surface and shift to neutral (N).
2. Apply the parking brake.
3. With the engine idling, shift to drive (D) and then to reverse (R) remove air from hydraulic circuits.
4. Shift to neutral (N).
5. Allow the engine to idle for approximately 1 minute.

6. Clean any dirt or debris from the end of the fill tube before removing the dipstick (1).
7. Remove the dipstick and wipe it clean.

NOTE

Manual transmission fluid level checks should be performed with the dipstick in the unscrewed or loose position.

8. Insert the dipstick into the fill tube. Push down until the dipstick stops while still in an unscrewed or loose position.
9. Remove the dipstick and observe the fluid level. If the transmission fluid is within the cold check band (2), the fluid level is satisfactory.
10. If necessary, add or remove transmission fluid until the transmission fluid level is within the cold check band.
11. Perform a hot manual check once the transmission fluid has reached 71°—93°C (160°—200°F).

For additional service and maintenance information, see the Allison Transmission® operator’s manual.

**Manual Check—Hot**

See Figures 5-3 and 5-4.

The hot check band (3) on the dipstick (1) offers the best assurance of maintaining the correct fluid levels. Hot checks should be performed at normal transmission operating fluid temperatures of 71°—93°C (160°—200°F). While a cold check must be performed prior to start-up, fluid levels for continued operation should be adjusted based on hot check results.

1. Ensure transmission fluid has reached a normal operating fluid temperature of 71°—93°C (160°—200°F).
2. Park the tractor on a level surface and shift to neutral (N).
3. Apply the parking brake.

4. Clean any dirt or debris from the end of the fill tube before removing the dipstick (1).
5. Remove the dipstick and wipe it clean.

**NOTE**

Manual transmission fluid level checks should be performed with the dipstick in the unscrewed or loose position.

6. Insert the dipstick into the fill tube. Push down until the dipstick stops while still in an unscrewed or loose position.

7. Remove the dipstick and observe the fluid level. If the transmission fluid is within the hot check band (3), the fluid level is satisfactory.
8. If necessary, add or remove transmission fluid until the transmission fluid level is within the hot check band.
9. Perform a hot manual check once again to ensure consistent measurements.

For additional service and maintenance information, see the Allison Transmission® operator’s manual.

**Electronic Check—Hot**

See Figure 5-5.

The electronic hot check offers additional information not available when performing a manual check. The transmission gear selector (4) will delay displaying the fluid level results until the following conditions are met:
- The transmission fluid temperature is above 40°C (104°F) or below 40°C (104°F).
- Transmission is in neutral (N).
- The tractor has been stationary for approximately 2 minutes to allow the fluid to settle.
- The engine is running at idle.

While an electronic check provides more specific information regarding the fluid level, a manual check should be performed to verify the electronic check results.

1. Park the tractor on a level surface and shift to neutral (N).
2. Apply the parking brake.

**NOTE**

The tractor must be completely stopped with a transmission output shaft speed of 0 rpm.

3. Allow the engine to idle.
4. Allow the transmission fluid to settle for 2 minutes.
5. Request a fluid level measurement and readout by simultaneously pressing the up-shift and down-shift buttons (5 and 6) once on the transmission gear selector (4).

6. Obtain the reading from the transmission gear selector display.

For additional information, see the Allison Transmission® operator’s manual

TRANSMISSION COOLER

Removal

See Figure 5-6.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)
2. Disconnect battery cables. (See “BATTERY” on page 3-3.)
3. Remove brush guard. (See “FRONT COVERS AND GUARDS” on page 14-3.)

5. Install identification tags and disconnect transmission lines (2 and 3). Close all openings using caps and plugs.

6. Remove cap screws (4), washers (5), lock nuts (6), and transmission cooler.

7. Repair or replace components as necessary.

Inspection

- Check hoses, lines, fittings, and clamps for wear or damage. Replace parts found to be unserviceable.
- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.
- Clean all parts of dirt and debris.

Installation

Installation is reverse of the removal procedure.

- Check transmission fluid level. (See “CHECK FLUID LEVEL” on page 5-2.)
- Fill transmission fluid as necessary. (See “Transmission Fluid Filling” on page 5-7.)

For additional information, see the Allison Transmission® operator’s manual.
TRANSMISSION FILTER

Removal
See Figure 5-7.

NOTE
Transmission fluid does not require draining if only filters are being replaced.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)
2. Disconnect battery cables. (See “BATTERY” on page 3-3.)
3. Position a suitable container under the lube and main filter covers (1 and 2).
4. Loosen cap screws (3) and allow transmission fluid to drain.
5. Remove cap screws, filter covers, and gaskets (4). Properly dispose of gaskets.
6. Remove and properly dispose of O-rings (5 and 6) and filters (7).
7. Repair or replace components as necessary.

Inspection
- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.
- Clean all parts of dirt and debris.
Installation

1. Lubricate and install new O-rings (5 and 6) on lube and main filter covers (1 and 2).
2. Lubricate O-ring inside filters (7).
4. Install new gaskets (4) onto filter covers and align holes in the gaskets to the holes in the covers.

**IMPORTANT**

Prevent possible damage to threads. Do not use the cap screws to draw in filter covers. Push the assemblies in by hand to seat the seals before installing cap screws.

5. Install filter and filter cover assemblies into filter compartment. Push the assemblies in by hand to seat the seals.
6. Install cap screws (3) and tighten to specification.

**Specification**

<table>
<thead>
<tr>
<th>Cap Screw—Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>51—61 N·m</td>
</tr>
<tr>
<td>38—45 lb·ft</td>
</tr>
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</table>

7. Check transmission fluid level. (See “CHECK FLUID LEVEL” on page 5-2.)
8. Fill transmission fluid as necessary. (See “Transmission Fluid Filling” on page 5-7.)

For additional information, see the Allison Transmission® operator’s manual.

**TRANSMISSION FLUID MAINTENANCE**

Transmission Fluid Draining

See Figure 5-8.

**NOTE**

Transmission fluid does not require draining if only filters are being replaced.

1. Ensure transmission fluid has reached a normal operating fluid temperature of 71°—93°C (160°—200°F).
2. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)
3. Disconnect battery cables. (See “BATTERY” on page 3-3.)

**Figure 5-8: Drain Plug**

4. Position a suitable container under the transmission drain plug (1).

**CAUTION**

Avoid injury and serious burns from draining transmission fluid. Avoid contact with hot transmission fluid.

**NOTE**

Transmission fluid should be drained while still at normal operating temperatures. Hot fluid flows quicker and drains more completely.
5. While still at normal operating temperatures, remove the drain plug and allow fluid to drain completely.

**Specification**

<table>
<thead>
<tr>
<th>Transmission Fluid—Capacity</th>
<th>27.4 L</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>29 qt</td>
</tr>
</tbody>
</table>

6. Examine the transmission fluid for signs of dirt, water, or debris.

For additional information, see the Allison Transmission® operator’s manual.

### Transmission Fluid Filling

See Figures 5-9 and 5-10.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

2. Replace the drain plug O-ring.

3. Install the drain plug (1) and tighten to specification.

**Specification**

<table>
<thead>
<tr>
<th>Drain Plug—Torque</th>
<th>25—32 N·m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>18—24 lb·ft</td>
</tr>
</tbody>
</table>

4. Clean any dirt or debris from the end of the fill tube before removing the dipstick (2).

5. Remove dipstick.

6. Add fluid as necessary.

7. Periodically perform a manual cold check to verify the transmission has adequate fluid for start-up and operation. (See “Manual Check—Cold” on page 5-2.)

8. Inspect area for leaks before operating the tractor.


10. Inspect for leaks.

For additional information, see the Allison Transmission® operator’s manual.
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INTRODUCTION
The purpose of the FRONT AXLE & STEERING section is to provide service and maintenance personnel with guidance on the proper procedures for servicing the front axle, front suspension, and steering system on TICO Pro-Spotter terminal trucks.

The TICO Pro-Spotter terminal trucks have been engineered for quick and efficient servicing while minimizing downtime. For best performance and longer vehicle life, follow the maintenance procedures provided in this section.

For additional information, please contact TICO factory support. (See “CONTACT TICO SUPPORT” on page 0-15.)

CHECK FLUID LEVEL

Front Axle Fluid
See Figure 6-1.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

![Figure 6-1: Front Axle Fluid Level](tpa-022)

2. Compare oil level line (4) to ADD and FULL lines (3 and 1) to determine proper oil capacity on both sides of truck.

3. If oil needs to be added, remove center plug (2).

**IMPORTANT**
Prevent possible machine damage. Do not overfill hub oil. Oil level line should not exceed specification.

4. Slowly add oil until oil level is level with FULL line. Do not exceed specification.

5. Compare oil level line to ADD and FULL lines to verify proper oil capacity on both sides of truck.

6. Install center plug. Tighten to specification.

### Specifications

| Oil Level Line—Distance (above FULL line, maximum) | 6.4 mm | 0.25 in |

| Center Plug—Torque | 13.8 N·m | 10 lb·ft |
DRAG LINK

Removal
See Figures 6-2 and 6-3.
1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

   ![Figure 6-2: Drag Link (front)](TPS-157)

   1 Cotter Pin
   2 Nut
   3 Drag Link End
   4 Drag Link

   Figure 6-2: Drag Link (front)

2. Using an appropriate lifting device, raise the front end of the tractor. (See “Use Lifting Equipment Safely” on page 1-4.)

3. Support the tractor using jack stands. (See “Support Tractor Securely” on page 1-3.)

   ![Figure 6-3: Drag Link (rear)](TPS-158)

   4 Drag Link
   5 Cotter Pin
   6 Nut
   7 Drag Link End
   8 Steering Arm

   Figure 6-3: Drag Link (rear)

4. Preventing the steering wheel from rotating will make the steering gear box alignment easier.

5. Lock steering wheel into place.

   ![Figure 6-2: Drag Link (front)](TPS-157)

   1 Cotter Pin
   3 Drag Link End
   4 Drag Link

   Figure 6-2: Drag Link (front)

   5. Remove cotter pin (1), nut (2), and drag link end (3).

   6. Remove cotter pin (5), nut (6), and drag link end (7).

   7. Remove drag link (4).

   8. Repair or replace components as necessary.

Inspection
- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.
- Clean all parts of dirt and debris.
- Inspect parts for wear or damage. Replace as needed.

Installation
Installation is the reverse of the removal procedure.
- Perform wheel alignment. (See “FRONT END ALIGNMENT” on page 6-5.)
FRONT AXLE & STEERING

FRONT AXLE

Removal
See Figures 6-4 and 6-5.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

2. Using an appropriate lifting device, raise the front end of the tractor. (See “Use Lifting Equipment Safely” on page 1-4.)

3. Support the tractor using jack stands. (See “Support Tractor Securely” on page 1-3.)

4. Release air system pressure. (See “RELIEVING AIR SYSTEM PRESSURE” on page 8-6.)

5. Install identification tags and disconnect air lines (1). Close all openings using caps and plugs.

6. Remove clips (2) and pins (3).

7. Remove nuts (4), washers (5), and brake chambers (6).

8. Place jack under axle (7) near the leaf spring (12) that is to be serviced. (See “Support Tractor Securely” on page 1-3.)

9. Remove front wheels.

10. Remove drag link. (See “DRAG LINK” on page 6-3.)

11. Remove lock nuts (8), washers (9), spacers (10), and U-bolts (11).

12. Lower and remove axle away from leaf spring.

13. Repair or replace components as necessary.

![Figure 6-5: Axle](TPS-159)

![Figure 6-6: Brake Chamber (left side shown)](TPS-163)

1. Air Line (2 used) 4. Nut (4 used)
2. Clip (2 used) 5. Washer (4 used)
3. Pin (2 used) 6. Brake Chamber (2 used)

7. Axle 10. Spacer (4 used)
8. Lock Nut (8 used) 11. U-Bolt (4 used)
9. Washer (8 used) 12. Leaf Spring (2 used)

![Figure 6-4: Brake Chamber (left side shown)](TPS-163)

5. Install identification tags and disconnect air lines (1). Close all openings using caps and plugs.

6. Remove clips (2) and pins (3).

7. Remove nuts (4), washers (5), and brake chambers (6).
**Inspection**

- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.
- Clean all parts of dirt and debris.
- Inspect parts for wear or damage. Replace as needed.

**Installation**

See Figure 6-6. Installation is the reverse of the removal procedure.

![Alignment Pin](Figure 6-6: Alignment Pin)

- Verify proper alignment. Locate alignment pin (13) with hole (14) in frame while installing upper plate (15).

---

**FRONT END ALIGNMENT**

Proper front end alignment is essential to tractor performance and longevity. Proper alignment ensures efficient steering and maximum tire life. Check the alignment at routine intervals or after any heavy impact to the front axle.

**Preparation**

- Properly adjust front end bearings. (See “FRONT WHEEL BEARINGS” on page 6-8.)
- Check to ensure that the steering tie rod, drag link ends, and king pins are not loose.
- Check the tires for proper inflation pressure and that the rim-to-floor are the same at each wheel. (See “TIRE PRESSURE” on page 2-11.)
- Check the wheel installation.

**Checking and Correcting Toe**

See Figure 6-7.

![Toe](Figure 6-7: Toe (viewed from above))

Toe-in is when the distance between the front wheels is less at the front of the axle than it is at the rear. Toe-in can cause excessive tire wear and unstable steering.

**Checking the Toe**

**NOTE**

*A work bay is needed for this procedure.*

1. Slowly drive the truck into the bay.
2. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)
3. Apply marks approximately 127 mm (5 in) up on the front side of both tires. Be sure the mark is parallel to the center tread rib.
4. Apply marks approximately 127 mm (5 in) up on the back side of both tires. Be sure the mark is parallel to the center tread rib.
5. Place a trammel bar behind the front tires with the pointers at the outside edge of the marks.
6. Adjust the trammel bar to point at the centerline height of the marks and secure the pointers when the bar is in place.
7. With the trammel bar pointers still set, align one pointer to the outside edge of the center tread rib mark.
8. Measure and record the distance between the pointer and the outside edge mark on the opposite tire.
9. The recorded distance is the toe measurement. Compare the recorded distance to the specification.

10. If measurement exceeds the specification, correct toe. (See “Correcting the Toe” on page 6-6.)

Correcting the Toe
1. If the toe measurement exceeds the specification, loosen both tie rod bar clamps.
2. Rotate the tie rod bar to correct the distance of the toe measurement.
3. When the specified distance is reached, tighten the tie rod bar on each end to specification.
4. Check the toe measurement before returning the tractor to service. (See “Checking the Toe” on page 6-5.)

### Checking and Correcting Camber

See Figures 6-8 and 6-9.

Figure 6-8: Wheel Alignment (camber)
Camber is the angle that the front wheels are tilted outward, or inward for a negative camber condition, at the top from the vertical position. Camber can cause excessive tire wear and unstable steering.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

#### Specifications

| Toe In—Distance | 1.587 mm | 0.063 in |

2. Using an appropriate lifting device, raise the front end of the tractor. (See “Use Lifting Equipment Safely” on page 1-4.)
3. Support the tractor using jack stands. (See “Support Tractor Securely” on page 1-3.)
4. Using a camber gauge, pull the bottom of the wheel outward and record the measurement.
5. Using a camber gauge, pull the top of the wheel outward and record the measurement.
6. Subtract the lowest reading from the highest reading. Record the calculated angle.
7. Compare the calculated angle to the specification.

**Specifications**

| Camber—Angle | 1/4° |

8. If measurement exceeds the specification, correct toe. (See “Correcting the Toe” on page 6-6.)
9. If the calculated angle exceeds the specification, adjust the wheel bearings. (See “Adjustment” on page 6-8.)
10. Repeat steps 4—7.
11. If the readings are within specification, check the toe. (See “Checking the Toe” on page 6-5.)
12. If the calculated angle continues to exceed the specification, inspect the steering knuckle bushings and king pins. (See “STEERING KNUCKLE” on page 6-14.)
13. Perform a wheel and tire check. (See “Checking Wheels and Tires” on page 6-7.)

14. If the calculated angle continues to exceed the specification, take a manual camber measurement.
   a. Using a square (1) measure the distance from the wheel (6) to the square in two locations as shown. Subtract distance A (2) from distance B (3) to calculate the camber (5).
   b. Measure both wheels. Compare the measurements to specification.

**Specifications**

<table>
<thead>
<tr>
<th>Camber—Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.24 mm</td>
</tr>
<tr>
<td>0.094 in</td>
</tr>
</tbody>
</table>

15. If the calculated angle continues to exceed the specification, the axle or steering knuckle is bent. (See “FRONT AXLE” on page 6-4 or “STEERING KNUCKLE” on page 6-14.)

**Checking Wheels and Tires**

**WARNING**

- Prevent possible crushing injury or death. Use appropriate lifting device.
- Support the tractor using properly rated jack stands. Never work under a tractor supported only by a jack.
- Do not use wood or concrete blocks to support the tractor. Failure to properly support the tractor may result in death or serious injury.

1. Using an appropriate lifting device, raise the side of the tractor. (See “Use Lifting Equipment Safely” on page 1-4.)
2. Support the tractor using jack stands. (See “Support Tractor Securely” on page 1-3.)
3. Place wheel chocks on rear wheels.
4. Shift the transmission shifter selector in the neutral (N) position. Release parking brake before exiting cab.
5. Rotate front wheels. Inspect for bulges, broken cords, or flat spots.
6. Repair or replace tires as necessary.
7. Perform front end alignment. (See “FRONT END ALIGNMENT” on page 6-5.)
FRONT WHEEL BEARINGS

Adjustment

See Figures 6-10 and 6-11.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

2. Using an appropriate lifting device, raise the side of the tractor. (See “Use Lifting Equipment Safely” on page 1-4.)

   WARNING

   • Prevent possible crushing injury or death. Use appropriate lifting device.
   • Support the tractor using properly rated jack stands. Never work under a tractor supported only by a jack.
   • Do not use wood or concrete blocks to support the tractor. Failure to properly support the tractor may result in death or serious injury.

3. Support the tractor using jack stands. (See “Support Tractor Securely” on page 1-3.)

4. Remove the cap screws (1), washers (2), hub cover (3), and gasket (4).

5. Verify brake drum and hub fasteners are tight.

6. Install a magnetic-base dial indicator on the lower portion of the hub (11) or brake drum.

    NOTE

    Do not push or pull the hub or the brake drum by the upper part and the lower part. Pulling or pushing by the upper and lower part will not give the correct reading.

7. Measure the axial play by pushing and pulling on each side of the hub or drum while taking the reading. Record highest and lowest readings.
8. Subtract the lowest reading from the highest reading. This number represents the axial play or total distance between pushing and pulling.

9. Compare calculated axial play to specification. If calculated play is outside of the specification, adjust the wheel bearings.

<table>
<thead>
<tr>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axial Play—Distance</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

10. If calculated play is within the specification, the wheel bearings are properly adjusted. No additional adjustments are required.

11. Remove the counter nut (5), lock washer (6), and lock ring (7).

**IMPORTANT**

Prevent possible damage to components. Do not strike the adjustment nut (8) with a metal hammer. Do not use a chisel or punch to loosen the adjustment nut. This may cause damage to the nut.

12. Tighten the adjustment nut (8) to specification while turning the tire in both directions.

<table>
<thead>
<tr>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjustment Nut—Torque</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

13. Loosen the adjustment nut completely.

14. Tighten the adjustment nut to specification while turning the tire in both directions.

15. Turn the adjustment nut counterclockwise 1/3 turn.

16. Install the counter nut (5), lock washer (6), and lock ring (7). Tighten counter nut to specification.

<table>
<thead>
<tr>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Counter Nut 28.6—66.7 mm 1-1/8 to 2-5/8 in, approximate—Torque</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

17. Install the gasket (4), hub cover (3), washers (2), and cap screws (1). Tighten cap screws to specification.

<table>
<thead>
<tr>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cap Screw—Torque</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

18. Lower vehicle to the ground.

19. Check vehicle operation.
Removal
See Figure 6-12.

NOTE
Procedure is written for the left side wheel bearing. Right side wheel bearing procedure is similar.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)
2. Using an appropriate lifting device, raise the front end of the tractor. (See “Use Lifting Equipment Safely” on page 1-4.)
3. Support the tractor using jack stands. (See “Support Tractor Securely” on page 1-3.)
4. Remove front wheels.
5. Remove drum.
6. Position a suitable container to receive the drained oil.
7. Remove plug and drain oil.
8. Remove cap screws (1), washers (2), hub cover (3) and gasket (4).
9. Remove counter nut (5), lock washer (6), and lock ring (7).
10. Using an appropriate lifting device, remove adjustment nut (8), outer wheel bearing (9), and hub (11).
11. Remove sealer cup (15) and inner wheel bearing (14).
12. Repair or replace components as necessary.

WARNING
• Prevent possible crushing injury or death. Use appropriate lifting device.
• Support the tractor using properly rated jack stands. Never work under a tractor supported only by a jack.
• Do not use wood or concrete blocks to support the tractor. Failure to properly support the tractor may result in death or serious injury.

Figure 6-12: Front Wheel Bearing Removal
Inspection

- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.
- Clean all parts of dirt and debris.
- Inspect parts for wear or damage. Replace as needed.
- Check all bearings and seals for damage. Replace parts found to be unserviceable.

Installation

Installation is the reverse of the removal procedure.

- Rotate drum in both directions when tightening the adjusting nut to ensure bearing surfaces are in contact.
- Back off adjusting nut 1/6 turn. Allowable play is within 0.03—0.30 mm (0.001—0.010 in).

Specifications

<table>
<thead>
<tr>
<th>Component</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cap Screw</td>
<td>33 N·m</td>
</tr>
<tr>
<td></td>
<td>24 lb·ft</td>
</tr>
<tr>
<td>Adjusting Nut</td>
<td>67.8 N·m</td>
</tr>
<tr>
<td></td>
<td>50 lb·ft</td>
</tr>
<tr>
<td>Jam Nut 28.6—66.8 mm</td>
<td>135.6—203.4 N·m</td>
</tr>
<tr>
<td>(1-1/8—2-5/8 in)</td>
<td>100—150 lb·ft</td>
</tr>
<tr>
<td>Jam Nut 66.8 mm and larger</td>
<td>135.6—271.2 N·m</td>
</tr>
<tr>
<td>(2-5/8 in and larger)</td>
<td>100—200 lb·ft</td>
</tr>
</tbody>
</table>

LEAF SPRING

Removal

See Figures 6-13, 6-14, and 6-15.

NOTE

Procedure is written for the left side cab latch. Right side cab latch procedure is similar.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

WARNING

- Prevent possible crushing injury or death. Use appropriate lifting device.
- Support the tractor using properly rated jack stands. Never work under a tractor supported only by a jack.
- Do not use wood or concrete blocks to support the tractor. Failure to properly support the tractor may result in death or serious injury.

2. Using an appropriate lifting device, raise the front end of the tractor. (See “Use Lifting Equipment Safely” on page 1-4.)

3. Support the tractor using jack stands. (See “Support Tractor Securely” on page 1-3.)

4. Place jack under axle (1) near the leaf spring (6) that is to be serviced. (See “Support Tractor Securely” on page 1-3.)
5. Remove front wheel.
6. Remove lock nuts (2), washers (3), spacers (4), and U-bolts (5).
7. Lower axle away from leaf spring.

**WARNING**

Prevent possible crushing injury or death. Use appropriate lifting device.

8. Using an appropriate lifting device, support leaf spring.

9. Remove bolt (7), washer (8), and lock nut (9) from leaf spring.

10. Remove bolt (10), washer (11), lock nut (12), and leaf spring.
11. Repair or replace components as necessary.

**Inspection**

- Inspect leaf springs for cracks or damage. Replace as needed.
- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.
- Clean all parts of dirt and debris.
- Inspect parts for wear or damage. Replace as needed.

**Installation**

See Figure 6-16.

Installation is the reverse of the removal procedure.
- Tighten lock nut (9) to specification.

**Specification**

<table>
<thead>
<tr>
<th>Component</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lock Nut (9)</td>
<td>461 N·m 340 lb·ft</td>
</tr>
</tbody>
</table>

**Figure 6-14: Leaf Spring**

**Figure 6-15: Leaf Spring**

**Figure 6-16: Alignment Pin**

- Verify proper alignment. Locate alignment pin (13) with hole (14) in frame while installing upper plate (15).
STEERING GEAR BOX

Removal
See Figures 6-17 and 6-18.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

**WARNING**
- Prevent possible crushing injury or death. Use appropriate lifting device.
- Support the tractor using properly rated jack stands. Never work under a tractor supported only by a jack.
- Do not use wood or concrete blocks to support the tractor. Failure to properly support the tractor may result in death or serious injury.

2. Using an appropriate lifting device, raise the front end of the tractor. (See “Use Lifting Equipment Safely” on page 1-4.)
3. Support the tractor using jack stands. (See “Support Tractor Securely” on page 1-3.)

**NOTE**
Preventing the steering wheel from rotating will make the steering gear box alignment easier.

4. Lock steering wheel into place.

5. Remove cotter pin (1) and nut (2) from drag link (3).

6. Remove drag link from steering arm (4).

Figure 6-17: Steering Arm

5. Remove cotter pin (1) and nut (2) from drag link (3).

7. Remove nut (5), cap screw (6), and steering shaft (7).

8. Remove hydraulic lines (8 and 9) from steering gear box (10). Close all openings using caps and plugs.

**WARNING**
Prevent possible crushing injury or death. Use appropriate lifting device.

9. Using an appropriate lifting device, support the steering gear box.
10. Remove cap screws (11), washers (12), nuts (13), and steering gear box.
11. Repair or replace components as necessary.
Inspection

• Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.
• Inspect hydraulic lines and fittings for leaks, holes, cracks, and loose connections. Replace parts found to be unserviceable.
• Clean all parts of dirt and debris.
• Inspect parts for wear or damage. Replace as needed.

Installation

Installation is the reverse of the removal procedure.

• Perform wheel alignment. (See “FRONT END ALIGNMENT” on page 6-5.)

STEERING KNuckle

Removal

See Figures 6-19 and 6-20.

**NOTE**

Procedure is written for the left side steering knuckle. Right side steering knuckle procedure is similar.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

2. Using an appropriate lifting device, raise the front end of the tractor. (See “Use Lifting Equipment Safely” on page 1-4.)
3. Support the tractor using jack stands. (See “Support Tractor Securely” on page 1-3.)
4. Release air system pressure. (See “RELIEVING AIR SYSTEM PRESSURE” on page 8-6.)

**WARNING**

• Prevent possible crushing injury or death. Use appropriate lifting device.
• Support the tractor using properly rated jack stands. Never work under a tractor supported only by a jack.
• Do not use wood or concrete blocks to support the tractor. Failure to properly support the tractor may result in death or serious injury.

5. Install identification tags and disconnect air lines (1). Close all openings using caps and plugs.
6. Remove clips (2) and pins (3).
7. Remove nuts (4), washers (5), and brake chambers (6).
8. Remove wheel bearing and hub assembly. (See “FRONT WHEEL BEARINGS” on page 6-8.)
9. Remove drag link. (See “DRAG LINK” on page 6-3.)
10. Remove tie rod bar. (See “TIE ROD BAR” on page 6-16.)
11. Remove cap screws (7), washers (8), upper cap (9), and gasket (10).
12. Remove cap screws (11), washers (12), lower cap (13), and gasket (14).

**WARNING**

Prevent possible crushing injury or death. Use appropriate lifting device.

13. Using appropriate lifting device, support steering knuckle (15).

**NOTE**

Use a brass hammer and drift to drive out draw key and king pin. Do not use heat on any axle parts.
14. Remove king pin (16), shims (17), and steering knuckle.
15. Repair or replace components as necessary.
**Inspection**

- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.
- Clean all parts of dirt and debris.
- Inspect parts for wear or damage. Replace as needed.
- Check all bushings (19) and shims (17) for damage. Replace parts found to be unserviceable.

**Installation**

Installation is the reverse of the removal procedure.

- Perform wheel alignment. (See “FRONT END ALIGNMENT” on page 6-5.)
TIE ROD BAR

Removal
See Figures 6-21 and 6-22.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

**WARNING**
- Prevent possible crushing injury or death. Use appropriate lifting device.
- Support the tractor using properly rated jack stands. Never work under a tractor supported only by a jack.
- Do not use wood or concrete blocks to support the tractor. Failure to properly support the tractor may result in death or serious injury.

2. Using an appropriate lifting device, raise the front end of the tractor. (See “Use Lifting Equipment Safely” on page 1-4.)
3. Support the tractor using jack stands. (See “Support Tractor Securely” on page 1-3.)

**NOTE**
Preventing the steering wheel from rotating will make the steering gear box alignment easier.
4. Lock steering wheel into place.

5. Remove cotter pin (1), nut (2), and tie rod end (3).

6. Remove cotter pin (5), nut (6), and tie rod end (7).
7. Remove tie rod bar (4).
8. Repair or replace components as necessary.

**Figure 6-21: Tie Rod Bar (left side shown)**

**Figure 6-22: Tie Rod Bar (right side shown)**

6. Remove cotter pin (5), nut (6), and tie rod end (7).
7. Remove tie rod bar (4).
8. Repair or replace components as necessary.

**Installation**
Installation is the reverse of the removal procedure.
- Perform wheel alignment. (See “FRONT END ALIGNMENT” on page 6-5.)
## Section 7
### REAR AXLE

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</thead>
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<td>Rear Drive Axle Fluid</td>
<td>7-2</td>
</tr>
<tr>
<td>Rear Drive Axle</td>
<td>7-2</td>
</tr>
<tr>
<td>Removal</td>
<td>7-4</td>
</tr>
<tr>
<td>Inspection</td>
<td>7-4</td>
</tr>
<tr>
<td>Installation</td>
<td>7-4</td>
</tr>
<tr>
<td>Rear Drive Axle Fluid Drain</td>
<td>7-5</td>
</tr>
<tr>
<td>Rear Drive Axle Fluid Filling</td>
<td>7-5</td>
</tr>
</tbody>
</table>
INTRODUCTION

The purpose of the REAR AXLE section is to provide service and maintenance personnel with guidance on the proper procedures for servicing the rear axles and related systems on the TICO Pro-Spotter terminal trucks. The TICO Pro-Spotter terminal trucks have been engineered for quick and efficient servicing while minimizing downtime.

For additional information, please contact TICO factory support. (See “CONTACT TICO SUPPORT” on page 0-15.)

CHECK FLUID LEVEL

Rear Drive Axle Fluid

See Figure 7-1.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

2. Position a suitable container below the fill plug (2) of the rear drive axle (1).

3. Remove fill plug.

4. Rear drive axle fluid should slowly seep from the bottom of the fill port if properly filled.

5. If no seepage occurs, insert a finger into the fill port to feel if the fluid level is just below. Add proper fluid. (See “Rear Drive Axle Fluid Filling” on page 7-5.)

6. If overfilled, excess fluid will drain from fill port. Allow excess fluid to drain until fluid slowly seeps.

7. Install fill plug and tighten to specification.

<table>
<thead>
<tr>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fill Plug—Torque</td>
</tr>
<tr>
<td>47.5 N·m (35 lb·ft)</td>
</tr>
</tbody>
</table>

REAR DRIVE AXLE

Removal

See Figures 7-2 and 7-3.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

2. Using appropriate lifting device, raise rear of tractor and support using jack stands. (See “Support Tractor Securely” on page 1-3.)

3. Release air system pressure. (See “RELIEVING AIR SYSTEM PRESSURE” on page 8-6.)

4. Remove left and right side rear fender and mud flap assemblies. (See “LEFT COVERS AND GUARDS” on page 14-8.)

3. Remove fill plug.

4. Rear drive axle fluid should slowly seep from the bottom of the fill port if properly filled.

5. If no seepage occurs, insert a finger into the fill port to feel if the fluid level is just below. Add proper fluid. (See “Rear Drive Axle Fluid Filling” on page 7-5.)

5. Remove cap screws (1), spacers (2), and caps (3).

6. Separate drive shaft (4) from rear drive axle (5).
Figure 7-3: Inner Rear Drive Axle (right side shown)
7. Remove wheels (6).

**NOTE**

The rear drive axle may be removed with the brake chambers (7) installed; however, removing the brake chambers will ease handling of the rear drive axle.

8. Install identification tags and disconnect air lines (8 and 9). Close all openings using caps and plugs.

9. Remove clips (10) and pins (11).

10. Remove nuts (12), washers (13), and brake chambers (7).

11. Remove cap screws (14), washers (15), lock nuts (16), and links (17).

**CAUTION**

Using appropriate lifting device, support rear drive axle.

12. Using appropriate lifting device, support rear drive axle.

13. Remove cap screws (18), washers (19), lock nuts (20), and upper and lower plates (21 and 22).

14. Using appropriate lifting device, remove rear drive axle.

15. Repair or replace components as necessary.

**Inspection**

- Clean all parts of dirt and debris.
- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.

**Installation**

See Figure 7-4.

Installation is the reverse of the removal procedure.

**Figure 7-4: Rear Drive Axle Alignment**

- Verify proper alignment. Locate alignment pins (23) with holes (24) in frame while installing upper plates (21).
REAR DRIVE AXLE FLUID MAINTENANCE

Rear Drive Axle Fluid Draining

See Figure 7-5.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

2. Position a suitable container below the drain plug (3) of the rear drive axle (1).

3. Remove fill and drain plugs (2 and 3).

4. Inspect and clean drain plug magnet of any metal debris.

5. Inspect condition of oil for containments, texture, and sediment particles. Contaminated fluid can be a sign of internal damage.

6. Fill rear drive axle. (See “Rear Drive Axle Fluid Filling” on page 7-5.)

![Figure 7-5: Rear Drive Axle Plugs](image)

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rear Drive Axle Fluid—Capacity</td>
<td>39.7 L (42 qt)</td>
</tr>
</tbody>
</table>

**CAUTION**

Avoid injury and serious burns from draining rear drive axle fluid. Avoid contact with hot rear drive axle fluid.

Rear Drive Axle Fluid Filling

See Figure 7-6.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

2. Install drain plug (3) if removed. Tighten drain plug to specification.

3. Remove fill plug (2).

4. Fill rear drive axle until fluid seeps from the bottom of the fill port.

5. Install fill plug and tighten to specification.

![Figure 7-6: Rear Drive Axle Plugs](image)

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drain Plug—Torque</td>
<td>34 N·m (25 lb-ft)</td>
</tr>
<tr>
<td>Rear Drive Axle Fluid—Capacity</td>
<td>39.7 L (42 qt)</td>
</tr>
<tr>
<td>Fill Plug—Torque</td>
<td>47.5 N·m (35 lb-ft)</td>
</tr>
</tbody>
</table>
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INTRODUCTION

The purpose of the AIR SYSTEM section is to provide service and maintenance personnel with guidance on the proper procedures for servicing pneumatic equipment on TICO Pro-Spotter terminal trucks. The air system is made up of an air compressor, air dryer, and air tanks, which supply air pressure to pneumatic subsystems including brakes, cab and seat suspension, and trailer connections.

The TICO Pro-Spotter terminal trucks have been engineered for quick and efficient servicing while minimizing downtime.

For additional information, please contact TICO factory support. (See “CONTACT TICO SUPPORT” on page 0-15.)

AIR BRAKE SYSTEM TESTS

The following air brake system tests should be performed periodically to determine the condition of the system. These tests are designed to help discover sluggish performance and/or system leaks before they become a major problem. Performing these tests does NOT rule out the importance and necessity of functional, dynamic controllability tests and other tests required in assuring vehicle safety and performance.

Low Air Buzzer and Light Test

1. Apply and release the brake pedal until air pressure drops below specification.

   Specification
   | Low Pressure Alarm (maximum pressure) | 483 kPa |
   |                                     | 4.8 bar |
   |                                     | 70 psi  |

2. The low air buzzer and dash warning light should come on.

Air System Maximum Pressure Test

1. Start engine and run at fast idle.
2. Monitor air pressure gauge.
3. Governor cutout should limit system air pressure to specification.

   Specification
   | Maximum System Pressure | 896 kPa |
   |                        | 9.0 bar |
   |                        | 130 psi |
   | Governor Cutout Pressure | 827 kPa |
   |                        | 8.3 bar |
   |                        | 120 psi |

Air System Leak Down Test

1. Disconnect the glad hands from the trailer.
2. Run engine at fast idle.
3. Allow air pressure to stabilize at operating pressure for at least 1 minute.

   Specification
   | Operating Pressure | 827 kPa |
   |                    | 8.3 bar |
   |                    | 120 psi |

5. Shut off engine and observe pressure gauge for 2 minutes.
6. Pressure drop should not exceed specification.

   Specification
   | Pressure Drop (2-minute period) | 14 kPa |
   |                                  | 0.1 bar |
   |                                  | 2 psi  |
Pressure Buildup, Low-Pressure Warning Cutoff, and Governor Cutout Test

1. Open reservoir drain valves and drain system.
2. Start engine and run at fast idle. Low-pressure warning should be active.
3. Begin timing pressure buildup when system pressure reaches 345 kPa/3.45 bar (50 psi). Record the following data;
   - The pressure at which low-pressure warning cuts off.
   - The time at which system pressure has reached 621 kPa/6.21 bar (90 psi). Elapsed time should not exceed specification.

4. Continue observing gauge. The governor cutout should limit system air pressure to specification.

<table>
<thead>
<tr>
<th>Specification</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-Pressure Warning Cutoff</td>
<td>414 kPa</td>
</tr>
<tr>
<td></td>
<td>4.1 bar</td>
</tr>
<tr>
<td></td>
<td>60 psi</td>
</tr>
<tr>
<td>System Pressure Buildup (time)</td>
<td>5 min</td>
</tr>
</tbody>
</table>

AIR DRYER Removal

See Figure 8-1.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

2. Release air system pressure. (See “RELIEVING AIR SYSTEM PRESSURE” on page 8-6.)

3. Disconnect air lines (1—3). Close all openings using caps and plugs.
4. Install identification tags and disconnect electrical connector (4).
5. Remove band (5).
6. Remove cap screws (6), washers (7), lock nuts (8), and air dryer (9).
7. Repair or replace components as necessary.

Figure 8-1: Air Dryer

- Avoid personal injury from explosion. Air system components may contain pressurized gases. Exposure to excessive heat may cause components to explode.
- Avoid personal injury from high-pressure gases or debris. High-pressure release of gases or debris from a pressurized system can cause penetrating injuries. Relieve system pressure from air system before servicing.
Inspection

- Clean all parts of dirt and debris.
- Inspect air lines, fittings, and valves for leaks, holes, cracks, and loose connections. Replace parts found to be unserviceable.
- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.

Installation

Installation is the reverse of the removal procedure.

AIR SYSTEM SCHEMATIC

Air system schematics are used to aid in servicing and troubleshooting pneumatic equipment. These schematics may differ greatly depending on the optional equipment installed. To view the most accurate applicable system schematic, contact TICO support. (See “CONTACT TICO SUPPORT” on page 0-15.)

AIR TANK

Removal

See Figures 8-2, 8-3, 8-4, and 8-5.

NOTE

Procedure is written for the left side air tank. Right side air tank procedure is similar.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)
2. Remove rear grate. (See “GRATES AND COVERS” on page 14-5.)

CAUTION

- Avoid personal injury from explosion. Air system components may contain pressurized gases. Exposure to excessive heat may cause components to explode.
- Avoid personal injury from high-pressure gases or debris. High-pressure release of gases or debris from a pressurized system can cause penetrating injuries. Relieve system pressure from air system before servicing.

3. Release air system pressure. (See “RELIEVING AIR SYSTEM PRESSURE” on page 8-6.)

4. Remove cap screw (1), washers (2), and lock nut (3).

5. Remove air release cables (4 and 5) from clamp (6) and set aside.

Figure 8-2: Air Release Cables and Clamp

Figure 8-3: Air Tank (rear view)
6. Disconnect air lines (7 and 8). Close all openings using caps and plugs.

7. Disconnect air line (13). Close all openings using caps and plugs.

8. Using an appropriate lifting device, support air tank (12).

9. Remove air release valve (15) as necessary.

10. Remove cap screws (11 and 16), washers (9 and 17), lock nuts (10 and 18), inside bands (14), and air tank (12).

11. Repair or replace components as necessary.

**Inspection**
- Clean all parts of dirt and debris.
- Inspect air lines, fittings, and valves for leaks, holes, cracks, and loose connections. Replace parts found to be unserviceable.
- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.

**Installation**
Installation is the reverse of the removal procedure.
- Loosely apply bands (14 and 19) to air tank (12) to aid in alignment.
- Position air release valve (15) for proper operation of air release cable (5) and tighten bands.
- Verify operation of air release cables.

**BRAKE MAINTENANCE**
A schedule for the periodic cleaning, inspection, and lubrication of brake equipment should be established. Brake linings and drums are subject to wear. To compensate for this wear, the brakes are equipped with automatic slack adjusters to maintain proper operation. The adjusters should be routinely checked to provide uniform lining clearance, correct travel of levers, and proper equalization.

Brakes should be cleaned, inspected, lubricated, and adjusted every time the hubs are removed.
RELIEVING AIR SYSTEM PRESSURE

See Figure 8-6.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)
2. Disconnect batteries. (See “BATTERY” on page 3-3.)
3. Pump brake pedal 30 times.

4. Release air pressure using air reservoir drain pull cords (1).

WET AIR TANK

Removal

See Figures 8-7, 8-8, and 8-9.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

2. Release air system pressure. (See “RELIEVING AIR SYSTEM PRESSURE” on page 8-6.)

3. Remove cap screw (1), washers (2), and lock nut (3).
4. Remove air release cables (4 and 5) from clamp (6) and set aside.

CAUTION

- Avoid personal injury from explosion. Air system components may contain pressurized gases. Exposure to excessive heat may cause components to explode.
- Avoid personal injury from high-pressure gases or debris. High-pressure release of gases or debris from a pressurized system can cause penetrating injuries. Relieve system pressure from air system before servicing.
5. Disconnect air lines (7—9). Close all openings using caps and plugs.
6. Remove air release valve (10) as necessary.

7. Disconnect air line (17). Close all openings using caps and plugs.
8. Using an appropriate lifting device, support wet air tank (16).
9. Remove cap screws (13 and 18), washers (14 and 19), lock nuts (15 and 20), lower bands (12), and wet air tank.
10. Repair or replace components as necessary.

**Inspection**
- Clean all parts of dirt and debris.
- Inspect air lines, fittings, and valves for leaks, holes, cracks, and loose connections. Replace parts found to be unserviceable.
- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.

**Installation**
Installation is the reverse of the removal procedure.
- Loosely apply bands (11 and 12) to wet air tank (16) to aid in alignment.
- Position air release valve (10) for proper operation of air release cable (4) and tighten bands.
- Verify operation of air release cables.
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INTRODUCTION
The purpose of the ABS/ATC SYSTEM section is to provide service and maintenance personnel with guidance on the proper procedures for servicing the electronic control unit and pneumatic braking equipment on TICO Pro-Spotter terminal trucks. The electronic control unit provides both antilock braking and traction control functionality. The brake system is fed from the air system.

The TICO Pro-Spotter terminal trucks have been engineered for quick and efficient servicing while minimizing downtime.

For additional information, please contact TICO factory support. (See “CONTACT TICO SUPPORT” on page 0-15.)

ANTILOCK BRAKE SYSTEM (ABS) CONTROLLER

Removal
See Figure 9-1.
1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)
2. Disconnect batteries. (See “BATTERY” on page 3-3.)
3. Remove front left cover. (See “FRONT COVERS AND GUARDS” on page 14-3.)

Inspection
- Clean all parts of dirt and debris.
- Inspect electrical connectors, wire insulation, and retainers for damage or corrosion. Replace as needed.
- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.

Installation
Installation is the reverse of the removal procedure.
- Test operation of brake system.

Figure 9-1: Antilock Brake System (ABS) Controller
1. Electrical Connector
2. Electrical Connector
3. Cap Screw (2 used)
4. Antilock Brake System (ABS) Controller
BOBTAIL PROPORTIONING VALVE

Removal
See Figure 9-2.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

   ![Figure 9-2: Bobtail Proportioning Valve](image)

   - Air Line
   - Air Line
   - Air Line
   - Cap Screw (2 used)
   - Bobtail Proportioning Valve
   - Washer (4 used)
   - Lock Nut (2 used)

   **CAUTION**
   - Avoid personal injury from explosion. Air system components may contain pressurized gases. Exposure to excessive heat may cause components to explode.
   - Avoid personal injury from high-pressure gases or debris. High-pressure release of gases or debris from a pressurized system can cause penetrating injuries. Relieve system pressure from air system before servicing.

2. Release air system pressure. (See “RELIEVING AIR SYSTEM PRESSURE” on page 8-6.)

3. Install identification tags and disconnect air lines (1—6). Close all openings using caps and plugs.

4. Remove cap screws (7), washers (8), lock nuts (9), and bobtail proportioning valve (10).

5. Repair or replace components as necessary.

**Inspection**
- Clean all parts of dirt and debris.
- Inspect air lines, fittings, and valves for leaks, holes, cracks, and loose connections. Replace parts found to be unserviceable.

**Installation**
- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.
- Test operation of brake system.
FRONT MODULATOR VALVE (IF EQUIPPED)

Removal
See Figure 9-3.
1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

![Image of Front Modulator Valve (if equipped)](TPS-115)

- **CAUTION**
  - Avoid personal injury from explosion. Air system components may contain pressurized gases. Exposure to excessive heat may cause components to explode.
  - Avoid personal injury from high-pressure gases or debris. High-pressure release of gases or debris from a pressurized system can cause penetrating injuries. Relieve system pressure from air system before servicing.

2. Release air system pressure. (See “RELIEVING AIR SYSTEM PRESSURE” on page 8-6.)

   **NOTE**
   Procedure addresses the right side front modulator valve (if equipped) (7). The left side procedure is similar. Technicians should only address the units which are malfunctioning.

   1. Install identification tags and disconnect air lines (1 and 2). Close all openings using caps and plugs.
   2. Install identification tags and disconnect electrical connector (3).
   3. Remove cap screws (4), washers (5), lock nuts (6), and front modulator valve (if equipped) (7).
   4. Repair or replace components as necessary.

Inspection
- Clean all parts of dirt and debris.
- Inspect air lines, fittings, and valves for leaks, holes, cracks, and loose connections. Replace parts found to be unserviceable.
- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.

Installation
Installation is the reverse of the removal procedure.
- Test operation of brake system.
FRONT QUICK RELEASE BRAKE VALVE

Removal

See Figures 9-4 and 9-5.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Avoid personal injury from explosion. Air system components may contain pressurized gases. Exposure to excessive heat may cause components to explode.</td>
</tr>
<tr>
<td>• Avoid personal injury from high-pressure gases or debris. High-pressure release of gases or debris from a pressurized system can cause penetrating injuries. Relieve system pressure from air system before servicing.</td>
</tr>
</tbody>
</table>

2. Release air system pressure. (See “RELIEVING AIR SYSTEM PRESSURE” on page 8-6.)

3. Remove brush guard. (See “FRONT COVERS AND GUARDS” on page 14-3.)

4. Install identification tags and disconnect air lines (1—3). Close all openings using caps and plugs.

5. Remove cap screws (4), washers (5), lock nuts (6), and front quick release brake valve (7).

6. Repair or replace components as necessary.

Inspection

- Clean all parts of dirt and debris.
- Inspect air lines, fittings, and valves for leaks, holes, cracks, and loose connections. Replace parts found to be unserviceable.
- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.

Installation

Installation is the reverse of the removal procedure.

- Test operation of brake system.
REAR MODULATOR VALVE (IF EQUIPPED)

Removal
See Figure 9-6.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

   **CAUTION**

   • Avoid personal injury from explosion. Air system components may contain pressurized gases. Exposure to excessive heat may cause components to explode.
   • Avoid personal injury from high-pressure gases or debris. High-pressure release of gases or debris from a pressurized system can cause penetrating injuries. Relieve system pressure from air system before servicing.

2. Release air system pressure. (See “RELIEVING AIR SYSTEM PRESSURE” on page 8-6.)

   **NOTE**

   Procedure includes servicing of both rear modulator valves (if equipped) (7). Technicians should only address the units which are malfunctioning.

3. Install identification tags and disconnect air lines (1 and 2). Close all openings using caps and plugs.

4. Install identification tags and disconnect electrical connectors (3).

5. Remove cap screws (4), washers (5), lock nuts (6), and rear modulator valves (if equipped) (7).

6. Repair or replace components as necessary.

Inspection

- Clean all parts of dirt and debris.
- Inspect air lines, fittings, and valves for leaks, holes, cracks, and loose connections. Replace parts found to be unserviceable.
- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.

Installation

Installation is the reverse of the removal procedure.

- Test operation of brake system.
REAR QUICK RELEASE BRAKE VALVE

Removal
See Figure 9-7.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

   CAUTION
   - Avoid personal injury from explosion. Air system components may contain pressurized gases. Exposure to excessive heat may cause components to explode.
   - Avoid personal injury from high-pressure gases or debris. High-pressure release of gases or debris from a pressurized system can cause penetrating injuries. Relieve system pressure from air system before servicing.

2. Release air system pressure. (See “RELIEVING AIR SYSTEM PRESSURE” on page 8-6.)

3. Install identification tags and disconnect air lines (1—4). Close all openings using caps and plugs.

4. Remove cap screws (5), washers (6), lock nuts (7), and rear quick release brake valve (8).

5. Repair or replace components as necessary.

Inspection
- Clean all parts of dirt and debris.
- Inspect air lines, fittings, and valves for leaks, holes, cracks, and loose connections. Replace parts found to be unserviceable.
- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.

Installation
Installation is the reverse of the removal procedure.
- Test operation of brake system.
Section 10

CHASSIS LUBRICATION SYSTEM

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  Inspection ................................................... 10-3
  Installation ................................................... 10-3
INTRODUCTION

The purpose of the CHASSIS LUBRICATION SYSTEM section is to provide service and maintenance personnel with guidance on the proper procedures for servicing automatic lubrication systems on the TICO Pro-Spotter terminal trucks.

The TICO Pro-Spotter terminal trucks have been engineered for quick and efficient servicing while minimizing downtime.

Automatic lubrication systems reduce service times further by ensuring components are kept properly lubricated during operation without requiring direct service labor.

For additional information, please contact TICO factory support. (See “CONTACT TICO SUPPORT” on page 0-15.)

AUTOMATIC LUBRICATION SYSTEM

Filling the Reservoir

See Figure 10-1.

If during a system inspection when it is visible that the reservoir has reached minimum level, the pump needs to be filled with an appropriate NLGI - grade lubricant. (See “RECOMMENDED LUBRICANTS AND CAPACITIES” on page 2-6.)

For filling the reservoir, follow the steps as described below to ensure that no contaminants and/or air enter the lubrication system.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

2. Remove dust cap (2).

3. Clean and inspect male filler coupler (3) on the automatic lubrication system. Verify coupler is free of dirt and debris.

IMPORTANT

When exchanging a bucket of grease, ensure there are no air pockets in the filler hose by making at least 3 strokes to circulate the grease.

4. With the male and female couplers of the filler pump connected, operate the filler pump for at least 3 strokes. Circulating the grease ensures there are no air pockets in the filler hose. This is especially important when exchanging buckets of grease.

5. Clean and inspect female filler coupler. Verify coupler is free of dirt and debris.

6. Connect the male filler coupler of the automatic lubrication system to the female couple of the filler pump.

IMPORTANT

Prevent possible damage to automatic lubrication system. Do not overfill reservoir. Reservoir should be filled only to maximum level mark.

NOTE

If automatic lubrication system is filled to the maximum level mark, the system may release excess lubricant or trapped air from underneath the follower plate through the system vent.

7. Fill reservoir with grease until top of follower plate reaches the maximum level mark on reservoir.

8. Install dust cap.

Removal

See Figures 10-2 and 10-3.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

2. Disconnect batteries. (See “BATTERY” on page 3-3.)

3. Install identification tags and disconnect electrical connector (1).
4. Install identification tags and disconnect lubrication lines (12). Close all openings using caps or plugs.

5. Support automatic lubrication system (4).

6. Remove cap screws (6), lock washers (7), washers (8), grommets (9), and backer plates (10).

7. Remove automatic lubrication system.

8. Repair or replace components as necessary.

- Verify magnetic key (5) is present. Replace magnetic key if missing.

**Installation**

Installation is reverse of removal procedure.

**Inspection**

- Clean all parts of dirt and debris.

- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.

- Check all lubrication lines for signs of leakage or damage. Replace parts found to be unserviceable.

- Check all pump elements (11) for signs of leakage or damage. Replace parts found to be unserviceable.
INTRODUCTION
The purpose of the HYDRAULIC SYSTEM section is to provide service and maintenance personnel with guidance on the proper procedures for removing and replacing the various hydraulic components on the TICO Pro-Spotter terminal trucks.

The TICO Pro-Spotter terminal trucks have been engineered for quick and efficient servicing while minimizing downtime. The hydraulic system is responsible for the fifth wheel boom and power steering operation.

Service and maintenance personnel should inspect the entire hydraulic system frequently for leaks, loose fittings, or damage.

For additional information, please contact TICO factory support. (See “CONTACT TICO SUPPORT” on page 0-15.)

CHECK FLUID LEVEL

Hydraulic Fluid
See Figure 11-1.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

NOTE
Fifth wheel boom should be powered down to fully lowered position whenever checking and servicing the hydraulic reservoir.

2. Lower fifth wheel boom to fully down position.

3. Check hydraulic reservoir sight glass (1) to determine hydraulic fluid level.

4. If necessary, remove filler cap (2) and add approved hydraulic oil to hydraulic reservoir (3).

5. Check hydraulic reservoir sight glass to verify hydraulic fluid level.

6. Install the filler cap.

7. Verify fifth wheel boom operation.
DIRECTIONAL CONTROL VALVE

Removal
See Figure 11-2.
1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

NOTE
Fifth wheel boom should be powered down to fully lowered position whenever checking and servicing the hydraulic reservoir.

2. Lower fifth wheel boom to fully down position.
3. Remove boom grate and boom heat shield. (See “GRATES AND COVERS” on page 14-5.)
4. Close hydraulic tank shut offs. (See “HYDRAULIC SYSTEM SHUT OFF VALVES” on page 11-6.)

5. Install identification tags and disconnect hydraulic lines (1—6). Close all openings using caps and plugs.
6. Install identification tags and disconnect solenoid (11) electrical connectors.
7. Remove cap screws (7), washers (8 and 9), lock nut (10), and directional control valve (12).
8. Repair or replace components as necessary.

Inspection
• Clean all parts of dirt and debris.
• Inspect hydraulic lines and fittings for leaks, holes, cracks, and loose connections. Replace parts found to be unserviceable.
• Inspect electrical connectors and wiring for damage, corrosion, or loose connections. Replace parts found to be unserviceable.
• Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.

Installation
Installation is the reverse of the removal procedure.
• Test boom operation.
HYDRAULIC FILTER ASSEMBLY

Removal
See Figure 11-3.
1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

NOTE
Fifth wheel boom should be powered down to fully lowered position whenever checking and servicing the hydraulic reservoir.
2. Lower fifth wheel boom to fully down position.
3. Close hydraulic tank shut offs. (See “HYDRAULIC SYSTEM SHUT OFF VALVES” on page 11-6.)

4. Position a suitable container below the hydraulic filter assembly (1).
5. Install identification tags and disconnect hydraulic lines (3 and 4). Close all openings using caps and plugs.
6. Remove U-bolts (8), washers (9), lock nuts (7), and clamp (6). Move clamp and air release cord (5) aside.
7. Remove cap screws (10), washers (11), and hydraulic filter assembly.
8. Position a suitable container below the hydraulic filter assembly. Remove and discard the hydraulic filter (2).
9. Repair or replace components as necessary.

Inspection
- Clean all parts of dirt and debris.
- Inspect hydraulic lines and fittings for leaks, holes, cracks, and loose connections. Replace parts found to be unserviceable.
- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.

Installation
Installation is the reverse of the removal procedure.
- Apply a thin film of clean hydraulic fluid to the filter gasket.
- Tighten hydraulic filter (2) by hand approximately 1/2 to 3/4 turn after filter gasket makes contact with the filter head.
- Test boom and steering operation.
HYDRAULIC FLUID MAINTENANCE

Hydraulic Fluid Draining
See Figure 11-4.
1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

NOTE
Fifth wheel boom should be powered down to fully lowered position whenever checking and servicing the hydraulic reservoir.
2. Lower fifth wheel boom to fully down position.
3. Position a suitable container to receive the drained oil.
4. Remove drain plug (4) and drain hydraulic oil.

CAUTION
Avoid injury and serious burns from hydraulic fluid. Avoid contact with hot hydraulic fluid.

Hydraulic Fluid Filling
See Figure 11-5.
1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

NOTE
Fifth wheel boom should be powered down to fully lowered position whenever checking and servicing the hydraulic reservoir.
2. Lower fifth wheel boom to fully down position.
3. Remove filler cap (2) and add approved hydraulic oil to hydraulic reservoir (3).
4. Check hydraulic fluid level. (See “CHECK FLUID LEVEL” on page 11-2.)
5. Install the filler cap.
6. Test boom and steering operation.
HYDRAULIC PUMP

Removal
See Figure 11-6.
1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)
2. Raise the cab.
3. Close hydraulic tank shut offs. (See “HYDRAULIC SYSTEM SHUT OFF VALVES” on page 11-6.)

4. Install identification tags and disconnect hydraulic lines (1—3). Close all openings using caps and plugs.
5. Remove cap screws (4), washers (5), and hydraulic pump (6).
6. Repair or replace components as necessary.

Inspection
- Clean all parts of dirt and debris.
- Inspect hydraulic lines and fittings for leaks, holes, cracks, and loose connections. Replace parts found to be unserviceable.
- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.

Installation
Installation is the reverse of the removal procedure.
- Test boom and steering operation.

HYDRAULIC SYSTEM SHUT OFF VALVES
See Figures 11-7 and 11-8.
1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

2. Close suction line shut off valve (3).

3. Close hydraulic tank-to-hydraulic pump line shut off valve (5).
<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>POSSIBLE CAUSE</th>
<th>SUGGESTED SOLUTION</th>
<th>ADDITIONAL INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydraulic pump excessively noisy</td>
<td>Hydraulic oil level is low</td>
<td>Fill reservoir with proper oil to specified level.</td>
<td>See “CHECK FLUID LEVEL” on page 11-2 or see “Hydraulic Fluid Filling” on page 11-5.</td>
</tr>
<tr>
<td>Suction filter restricted</td>
<td>Clean or replace suction filter.</td>
<td></td>
<td>See “HYDRAULIC FILTER ASSEMBLY” on page 11-4.</td>
</tr>
<tr>
<td>Suction line restricted or collapsed</td>
<td>Install new suction line.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improper viscosity hydraulic oil (too heavy)</td>
<td>Drain and refill with proper oil to specified level.</td>
<td></td>
<td>See “LUBRICATION CHART” on page 2-9 or see “Hydraulic Fluid Draining” on page 11-5.</td>
</tr>
<tr>
<td>Hydraulic oil temperature is too high</td>
<td>Hydraulic oil level is low.</td>
<td>Fill reservoir with proper oil to specified level.</td>
<td></td>
</tr>
<tr>
<td>Machine overloaded</td>
<td>Remove overload from machine.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improper viscosity hydraulic oil (too light)</td>
<td>Drain and refill with proper oil to specified level.</td>
<td></td>
<td>See “LUBRICATION CHART” on page 2-9 or see “Hydraulic Fluid Draining” on page 11-5.</td>
</tr>
<tr>
<td>Boom operation slow or sluggish</td>
<td>Hydraulic oil level is low</td>
<td>Fill reservoir with proper oil to specified level.</td>
<td>See “CHECK FLUID LEVEL” on page 11-2 or see “Hydraulic Fluid Filling” on page 11-5.</td>
</tr>
<tr>
<td>Boom leaks down</td>
<td>Hydraulic pump pressure is low</td>
<td>Repair or replace hydraulic pump.</td>
<td>See “HYDRAULIC PUMP” on page 11-6.</td>
</tr>
<tr>
<td>Cylinder piston packing leaking</td>
<td>Repair or replace boom cylinder.</td>
<td></td>
<td>See “BOOM CYLINDERS” on page 12-4.</td>
</tr>
<tr>
<td>Directional control valve leaking internally</td>
<td>Repair or replace directional control valve.</td>
<td></td>
<td>See “DIRECTIONAL CONTROL VALVE” on page 11-3.</td>
</tr>
<tr>
<td>Boom cylinder leaking externally</td>
<td>Damaged or worn rod seal and wiper</td>
<td>Repair or replace boom cylinder.</td>
<td>See “BOOM CYLINDERS” on page 12-4.</td>
</tr>
<tr>
<td>Hydraulic pump leaking at shaft</td>
<td>Worn or damaged shaft seal</td>
<td>Repair or replace hydraulic pump.</td>
<td>See “HYDRAULIC PUMP” on page 11-6.</td>
</tr>
<tr>
<td></td>
<td>Worn or damaged bearings</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
HYDRAULIC TANK

Removal

See Figures 11-9, 11-10, 11-11, and 11-12.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)
2. Close hydraulic tank shut offs. (See “HYDRAULIC SYSTEM SHUT OFF VALVES” on page 11-6.)
3. Drain hydraulic tank. (See “Hydraulic Fluid Draining” on page 11-5.)

4. Remove U-bolts (7), washers (8), lock nuts (6), and clamp (5). Move clamp and air release cord (4) aside.

**NOTE**
The hydraulic lines (2 and 3) do not need to be removed from the hydraulic filter assembly (1).

5. Remove cap screws (9) and washers (10) and set hydraulic filter assembly (1) aside.

6. Install identification tags and disconnect hydraulic line (3). Close all openings using caps and plugs.

7. Remove cap screw (14), washers (15), lock nut (16), and clamp (7).
8. Install identification tags and disconnect hydraulic line (18). Close all openings using caps and plugs.


**CAUTION**

Prevent possible crushing injury from heavy component. Use appropriate lifting device.

10. Using an appropriate lifting device, support hydraulic tank (11).

11. Remove cap screws (12), washers (13), lock nuts (19), and hydraulic tank.

12. Repair or replace components as necessary.

**Inspection**

- Clean all parts of dirt and debris.
- Inspect hydraulic lines and fittings for leaks, holes, cracks, and loose connections. Replace parts found to be unserviceable.
- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.

**Installation**

Installation is the reverse of the removal procedure.

- Fill hydraulic tank (11). (See “Hydraulic Fluid Filling” on page 11-5.)
- Test boom and steering operation.
## INTRODUCTION

### BOOM

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**INTRODUCTION**

The purpose of the BOOM AND FIFTH WHEEL section is to provide service and maintenance personnel with guidance on the proper service procedures for boom and fifth wheel systems on the TICO Pro-Spotter terminal trucks.

The TICO Pro-Spotter terminal trucks have been engineered for quick and efficient servicing while minimizing downtime.

Service and maintenance personnel must inspect, lubricate, and service the hydraulic boom and fifth wheel systems regularly to maintain proper operation.

For additional information, please contact TICO factory support. (See “CONTACT TICO SUPPORT” on page 0-15.)

---

**BOOM**

**Removal**

See Figures 12-1 and 12-2.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

**NOTE**

The boom may be removed with the fifth wheel installed; however, removing the fifth wheel will ease handling the boom.

2. Remove fifth wheel top plate. (See “FIFTH WHEEL TOP PLATE” on page 12-8.)

3. Remove boom grate and boom heat shield covers. (See “GRATES AND COVERS” on page 14-5.)

---

**Figure 12-1: Boom (exploded view)**

4. Remove cap screws (1) and nuts (2) to allow removal of boom cylinder pins (3).

---

1. Cap Screw (2 used)  
2. Nut (2 used)  
3. Boom Cylinder Pin (2 used)  
4. Boom  
5. Washer (as required)  
6. Nut  
7. Washer (2 used)  
8. Bushing (4 used)  
9. Lock Plate  
10. Boom Pin
5. Using an appropriate lifting device, support boom (4).

**CAUTION**
Prevent possible crushing injury from heavy component. Use appropriate lifting device.


7. Remove clamps (12) securing hydraulic lines to boom.

8. Remove clamps (13) securing release cylinder air hose to boom.

9. Remove nut (14).

10. Support bushings (18) and washers (15—17). Drive out and remove boom pin (20).

**CAUTION**
Prevent possible crushing injury from heavy component. Use appropriate lifting device.

11. Using appropriate lifting device, lift boom clear of frame.

12. With boom removed, position boom cylinders against drive axle.

13. Repair or replace components as necessary.

---

**Inspection**
- Check all welds for cracks and have any cracks welded.
- Check boom pin (20) for excessive wear. Replace pins found unserviceable.
- Check boom cylinder pins (3) for excessive wear. Replace pins found unserviceable.
- Check bushings (18) for wear. Press worn bushings out.
- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.

**Installation**
Installation is the reverse of the removal procedure.
- Service all grease fittings.
- Test operation of boom and fifth wheel top plate.
BOOM CYLINDERS

Removal
See Figures 12-3 and 12-4.
1. Raise boom approximately 15.2 cm (6 in).
2. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)
3. Remove boom grate and boom heat shield covers. (See “GRATES AND COVERS” on page 14-5.)
4. Remove cap screws (1), washers (2), lock nuts (3), and both caps (4).

**CAUTION**
Using an appropriate lifting device, support boom (7).
5. Retract both boom cylinders (5) completely.
6. Install identification tags and disconnect hydraulic lines (8 and 9). Close all openings using caps and plugs.
7. Remove cap screws (10), washers (11), and lock nuts (12).

**CAUTION**
Prevent possible crushing injury from heavy component. Use appropriate lifting device.
8. Using an appropriate lifting device, support boom cylinders.
9. Remove cylinder pins (13) and lower boom cylinders to floor.
10. Repair or replace components as necessary.

Inspection
- Check all welds for cracks and have any cracks welded.
- Check cylinder pins (13) for excessive wear. Replace pins found unserviceable.
- Check bushings (14) for wear. Press worn bushings out.
- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.

Installation
Installation is the reverse of the removal procedure.
- Service all grease fittings.
- Test operation of boom cylinders.
FIFTH WHEEL MAINTENANCE

Adjustment

See Figures 12-5, 12-6, and 12-7.
Fifth wheel adjustments should be performed at a minimum of every 60,000 miles or if excessive movement between the kingpin and fifth wheel is noticed while driving the vehicle.

WARNING

Failure to maintain proper fifth wheel adjustment could result in loss of vehicle control, which if not avoided, could result in death or serious injury.

IMPORTANT

Excessive movement between the tractor and trailer can affect vehicle handling.

NOTE

To obtain proper fifth wheel adjustment, SAF-HOLLAND™ recommends the use of the HOLLAND lock tester (part number TF-TLN-5001). The HOLLAND lock tester is available from a local HOLLAND distributor.

1. Loosen the adjustment nut (13) 5 or 6 turns.
2. If the fifth wheel is locked, pull the release handle to unlock the fifth wheel. If equipped with a manual secondary lock, first pull the secondary release handle and hook on the top plate casting.

NOTE

For specific lock tester instructions, visit SAF-HOLLAND online (www.safholland.us) and refer to SAF-HOLLAND document number XL-FW10082ST-en-US.

3. Use the lock tester to couple and uncouple the fifth wheel 3 times to help “seat” the yoke.

Figure 12-5: Loosening the Adjustment Nut

4. With the locks closed around the lock tester, position the adjustment nut on yoke shaft so it is slightly compressing the rubber washer. This will make it difficult to turn the adjustment nut by hand.

Figure 12-6: Compressing the Rubber Washer

5. Turn the adjustment nut 1 additional turn clockwise to further compress the rubber washer.

Figure 12-7: Clockwise Adjustment

IMPORTANT

Over-compressing the rubber washer with additional turns will take the fifth wheel out of proper adjustment and degrade the performance of the fifth wheel.

6. Repeat the coupling and uncoupling process with the lock tester at least twice to help “seat” the yoke.
7. Confirm that the rubber washer cannot be turned by hand. If it can, repeat the adjustment procedures.
8. Remove the lock tester from the fifth wheel.
Lubrication

Air Cylinder

See Figure 12-8.

Figure 12-8: Air Cylinder

1. Inspect air cylinder tube (8) and piston shaft (9) for dents, bending, or other damage. Replace as necessary.
2. Engage air cylinder control to extend the piston shaft fully.
3. Clean exposed piston shaft with penetrating oil and a clean shop towel. Do not use abrasives on the exposed shaft as they could damage the piston shaft.
4. Disengage air cylinder control to retract the piston and shaft.
5. Remove the supply air line and add four drops of air tool oil to cylinder through supply fitting (12).
6. Reinstall supply air line.
7. Engage and disengage air cylinder control 3 times to work the air tool oil into the cylinder and onto the piston.
8. Verify proper operation.

Contact Surface

See Figure 12-9.

Figure 12-9: Fifth Wheel Lubrication Surface

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)
2. Remove old grease and debris from the fifth wheel lubrication surface (11).
3. Apply new water-resistant, lithium-based grease to the fifth wheel lubrication surface.
4. Clean grease grooves if a large amount of debris is present.
Locking Mechanism

See Figure 12-10.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

2. Using an appropriate lifting device, remove fifth wheel top plate (10). (See “FIFTH WHEEL TOP PLATE” on page 12-8.)

3. Using water-resistant, lithium-based grease, lubricate the yoke tips (1) where it contacts the locks and top plate casting.

4. Using water-resistant, lithium-based grease, lubricate cam profile (2).

5. Using water-resistant, lithium-based grease, lubricate yoke shaft (3) along the sliding surface.

6. Using water-resistant, lithium-based grease, lubricate secondary lock (4) where it contacts the cam plate.

7. Using water-resistant, lithium-based grease, lubricate release handle (5).

8. Using water-resistant, lithium-based grease, lubricate lock jaws (6) where it contacts the kingpin.

9. Using a light oil, lubricate the cam pivot point (7).

Figure 12-10: Fifth Wheel Lubrication Locations
FIFTH WHEEL TOP PLATE

Removal
See Figures 12-11 and 12-12.
1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)
2. Raise boom approximately 15.24 cm (6 in) to increase access to underside of fifth wheel.

![Figure 12-11: Air Line](TPS-105)

3. Disconnect air line (13) from air cylinder tube (8). Close all openings using caps and plugs.

![Figure 12-12: Fifth Wheel Top Plate](TPS-029)

4. Remove nuts (3) and cap screws (2).
5. Using a pry bar, pull the bracket pins (4) out of the fifth wheel top plate (1).

CAUTION
Prevent possible crushing injury from heavy component. Use appropriate lifting device.

6. Using an appropriate lifting device, remove the top plate.
7. Place the fifth wheel top plate on a flat, clean working area.

Inspection
See Figure 12-13.
- Clean all parts of dirt and debris.
- Inspect air lines, fittings, and valves for leaks, holes, cracks, and loose connections. Replace parts found to be unserviceable.
- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.

![Figure 12-13: Pocket Insert Inspection](TPS-031)

- Inspect pocket inserts and replace if:
  a. Pocket insert thickness (5) is less than specification.
  b. Free vertical movement of top plate (6) on bracket exceeds specification without compressing rubber bushings.

<table>
<thead>
<tr>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pocket Insert—Thickness</td>
</tr>
<tr>
<td>(minimum)</td>
</tr>
</tbody>
</table>
c. Pocket inserts are severely chipped, cracked, or gouged.

**Installation**

See Figures 12-14 and 12-15.

1. If pocket inserts (7) are dislodged, clean pocket areas (9).
2. Apply double-face tape (8) to bottom of each pocket area.
3. Install pocket inserts by pressing down firmly into pocket areas.

---

![Figure 12-14: Pocket Area](TPS-030)

- Pocket Insert (2 used) 9 Pocket Area (2 used)
- Double-Face Tape (as necessary)

---

**Specification**

<table>
<thead>
<tr>
<th>Top Plate Vertical Movement—Distance (maximum)</th>
<th>12.7 mm</th>
<th>0.5 in</th>
</tr>
</thead>
</table>

---

**CAUTION**

Prevent possible crushing injury from heavy component. Use appropriate lifting device.

4. Using an appropriate lifting device, install fifth wheel top plate (1) onto mounting base (10).
5. Install bracket pins (4) through the fifth wheel top plate and mounting base.
6. Install cap screws (2) and nuts (3). Tighten nuts to specification.

---

**Specification**

<table>
<thead>
<tr>
<th>Nut—Torque</th>
<th>68—81 N·m</th>
<th>50—60 ft·lb</th>
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</thead>
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![Figure 12-15: Fifth Wheel Top Plate](TPS-029)
## Section 13

### CAB

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INTRODUCTION

The purpose of the CAB section is to provide service and maintenance personnel with guidance on the proper procedures for removing and replacing of the various cab components and the cab hydraulic tilt system on the TICO Pro-Spotter terminal trucks.

The TICO Pro-Spotter terminal trucks have been engineered for quick and efficient servicing while minimizing downtime.

Service and maintenance personnel should only remove components deemed necessary for the service or maintenance procedure being performed.

For additional information, please contact TICO factory support. (See “CONTACT TICO SUPPORT” on page 0-15.)

CAB AIR BAG

Adjustment

See Figures 13-1 and 13-2.

NOTE

Procedure is written for the right side cab latch. Left side cab latch procedure is similar.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

Figure 13-1: Lock Bar

2. Raise cab completely and allow it to settle into detent position 1 (full open) (1) of the lock bar (4).
3. Apply alignment marks to cab frame and cab air bag (6) to aid when adjusting.
4. Loosen lock nuts (5).
5. Adjust cab air bag by repositioning cab air bag on the cab frame as necessary.
6. Tighten lock nuts.
7. Slowly lower cab. Check alignment between cab air bag striker and cab latch. (See “CAB LATCH” on page 13-7.)

**Removal**


**NOTE**

Removal of the left side cab air shock is shown. Right side cab air shock procedure is similar.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

**CAUTION**

- Avoid personal injury from explosion. Air system components may contain pressurized gases. Exposure to excessive heat may cause components to explode.
- Avoid personal injury from high-pressure gases or debris. High-pressure release of gases or debris from a pressurized system can cause penetrating injuries. Relieve system pressure from air system before servicing.

3. Release air system pressure. (See “RELIEVING AIR SYSTEM PRESSURE” on page 8-6.)
4. Remove nut (5) and disconnect linkage (6).

5. Remove lock nuts (7) and washers (8). Set cab leveling valve (9) aside.

6. Install identification tags and disconnect air line (10) at housing (11).

7. Apply alignment marks to housing and cab frame to aid when installing.

8. Remove cap screws (12), washers (13), lock nuts (14), and housing.

9. Remove lock nuts (15) and cab air bag striker (16) from cab air bag (17).

10. Remove nuts (18) and cab air bag from housing.

11. Repair or replace components as necessary.

**Inspection**

- Clean all parts of dirt and debris.
- Inspect air lines, fittings, and connections for leaks, holes, cracks, and loose connections. Replace parts found to be unserviceable.
- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.

**Installation**

Installation is the reverse of the removal procedure.

- Check cab air bag alignment with cab latch. (See “Adjustment” on page 13-3.)
CAB DOOR AIR PRESSURE ADJUSTMENT

See Figures 13-7 and 13-8.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

2. Raise cab completely and allow it to settle into detent position 1 (full open) (1) of the lock bar (4).

3. Read air pressure gauge (5) and determine if adjustment is necessary.

4. Lift adjustment knob (6).

**IMPORTANT**
Prevent possible component damage. Cab door air pressure must be set between 207—345 kPa (30—50 psi). Exceeding or reducing beyond this range can cause damage to the air closure or operating mechanism.

5. Turn adjustment knob clockwise to increase cab door air pressure.

6. Turn adjustment knob counterclockwise to decrease cab door air pressure.

7. Read air pressure gauge after adjustment. Verify new pressure is within specification.

<table>
<thead>
<tr>
<th>Specification</th>
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<tr>
<td>Cab Door Air Pressure Range—Pressure</td>
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</table>

8. Lower the cab.


10. Allow air pressure to stabilize at normal operating pressure for at least 1 minute.

11. Operate cab door and verify adjustments.
CAB LATCH

Adjustment

See Figures 13-9 and 13-10.

NOTE

Procedure is written for the left side cab latch. Right side cab latch procedure is similar.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

2. Raise cab completely and allow it to settle into detent position 1 (full open) (1) of the lock bar (4).

3. Apply alignment marks to bracket and adjuster to aid when adjusting.

4. Loosen lock nuts (9).

5. Adjust cab latch (10) by repositioning cab latch on the frame as necessary.

6. Tighten lock nuts.

7. Slowly lower cab. Check alignment between cab latch and cab air bag striker. (See “CAB AIR BAG” on page 13-3.)

Figure 13-9: Lock Bar

2. Detent Position 2 (half open)

3. Detent Position 3 (minimum open)

4. Lock Bar

Figure 13-10: Cab Latch (left side shown)

2. Cab Latch

4. Lock Nut (4 used)
Removal

See Figures 13-11 and 13-12.

**NOTE**

Procedure is written for the left side cab latch. Right side cab latch procedure is similar.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

**Figure 13-11: Lock Bar**

2. Raise cab completely and allow it to settle into detent position 1 (full open) (1) of the lock bar (4).

3. Apply alignment marks to bracket and adjuster to aid when installing.

4. Install identification tags and disconnect hydraulic lines (5 and 6). Close all openings using caps and plugs.

5. Remove cap screws (7), washers (8), lock nuts (9), and cab latch (10).

6. Repair or replace components as necessary.

**Inspection**

- Clean all parts of dirt and debris.
- Inspect hydraulic lines, fittings, and connections for leaks, holes, cracks, and loose connections. Replace parts found to be unserviceable.
- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.

**Figure 13-12: Cab Latch (left side shown)**

3. Apply alignment marks to bracket and adjuster to aid when installing.

4. Install identification tags and disconnect hydraulic lines (5 and 6). Close all openings using caps and plugs.

5. Remove cap screws (7), washers (8), lock nuts (9), and cab latch (10).

6. Repair or replace components as necessary.

**Installation**

Installation is the reverse of the removal procedure.

- Check cab air shock alignment with latch. (See “Adjustment” on page 13-7.)
CAB LEVELING VALVE

Adjustment

See Figures 13-13 and 13-14.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

2. Raise cab completely and allow it to settle into detent position 1 (full open) (1) of the lock bar (4).

3. Apply alignment marks to bracket and adjuster to aid when adjusting.

4. Loosen lock nuts (12).

5. Adjust cab leveling valve (5) by repositioning lower portion of cab leveling valve as necessary.

6. Tighten lock nuts.

7. Lower cab.

8. Operate tractor and allow air pressure to increase to normal operating pressure.

9. Check cab ride height for leveling.
Removal

See Figures 13-15 and 13-16.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

   2. Raise cab completely and allow it to settle into detent position 1 (full open) (1) of the lock bar (4).

   3. Apply alignment marks to bracket and adjuster to aid when installing.

Figure 13-15: Lock Bar

   1 Detent Position 1 (full open)  3 Detent Position 3 (minimum open)
   2 Detent Position 2 (half open)  4 Lock Bar

   Figure 13-16: Cab Leveling Valve

4. Install identification tags and disconnect air lines (6—8). Close all openings using caps and plugs.

5. Remove nut (9) and disconnect linkage (10).

6. Remove lock nuts (12), washers (11), and cab leveling valve (5).

7. Repair or replace components as necessary.

Inspection

- Clean all parts of dirt and debris.
- Inspect air lines, fittings, and connections for leaks, holes, cracks, and loose connections. Replace parts found to be unserviceable.
- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.

Installation

Installation is the reverse of the removal procedure.

- Check cab ride height and adjust as necessary. (See “Adjustment” on page 13-9.)
CAB TILT CYLINDER

Removal

See Figures 13-17 and 13-18.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

2. Raise cab completely and allow it to settle into detent position 1 (full open) (1) of the lock bar (4).

3. Press the cab lower button again to reduce cab tilt hydraulic pressure on the cab tilt cylinder (5).

4. Install identification tags and disconnect cab tilt pump-to-cab tilt cylinder hydraulic line (9). Close all openings using caps and plugs.

5. Remove roll pin (6).

6. Using appropriate lifting device, support cab tilt cylinder.

7. Remove cylinder pin (7) and spacers (8).

8. Remove roll pin (10).

9. Remove cylinder pin (12), spacers (11), and cab tilt cylinder.

10. Repair or replace components as necessary.

**CAUTION**

Avoid personal injury from high-pressure fluid. High-pressure release of oil from a pressurized system can cause serious burns or penetrating injury. Relieve pressure from cab tilt hydraulic system before servicing.
**Inspection**

- Clean all parts of dirt and debris.
- Inspect hydraulic hoses, fittings, and clamps for leaks, holes, cracks, and loose connections. Replace parts found to be unserviceable.
- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.
- Inspect cab tilt cylinder for damage. Repair or replace as needed.

**Installation**

Installation is the reverse of the removal procedure.

- Check cab tilt system fluid level. (See “Cab Tilt Hydraulic Fluid Filling” on page 13-12.)

---

**CAB TILT HYDRAULIC FLUID MAINTENANCE**

**Cab Tilt Hydraulic Fluid Draining**

See Figure 13-19.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)
2. Lower cab completely and allow it to settle into full resting position.
3. Remove cab tilt pump cover. (See “LEFT COVERS AND GUARDS” on page 14-8.)
4. Position a suitable container below the cab tilt pump-to-cab tilt cylinder hydraulic line (1) at the rear of the cab tilt pump (1).
5. Install identification tags and disconnect cab tilt pump-to-cab tilt cylinder hydraulic line.
6. Allow cab tilt hydraulic fluid to drain.
7. Remove cab tilt pump if necessary. (See “CAB TILT PUMP” on page 13-13.)
8. Drain cab tilt hydraulic fluid from cab tilt pump reservoir.
9. Install cab tilt pump if necessary. (See “CAB TILT PUMP” on page 13-13.)
10. Connect cab tilt pump-to-cab tilt cylinder hydraulic line.
11. Fill cab tilt hydraulic fluid. (See “Cab Tilt Hydraulic Fluid Filling” on page 13-12.)

---

**Cab Tilt Hydraulic Fluid Filling**

See Figure 13-20.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)
2. Lower cab to fully down position.
3. Remove reservoir cap (3).
4. Add oil to fill reservoir.
5. Compare actual fluid level (4) to applied level mark (2) on the cab tilt reservoir (1).
6. Install the reservoir cap.
7. Tilt cab to verify proper operation.
CAB TILT PUMP

Removal
See Figure 13-21.
1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)
2. Lower cab completely and allow it to settle into full resting position.
3. Remove cab tilt pump cover. (See “LEFT COVERS AND GUARDS” on page 14-8.)

4. Install identification tags and disconnect electrical connectors (1 and 2).
5. Install identification tags and disconnect hydraulic line (3). Close all openings using caps and plugs.
6. Remove cap screws (4), washers (5), and cab tilt pump (6).
7. Repair or replace components as necessary.

Inspection
- Clean all parts of dirt and debris.
- Inspect hydraulic lines, fittings, and connections for leaks, holes, cracks, and loose connections. Replace parts found to be unserviceable.
- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.
- Inspect electrical connectors and wiring for damage, corrosion, or loose connections. Replace parts found to be unserviceable.

Installation
Installation is the reverse of the removal procedure.

CHECK FLUID LEVEL

Cab Tilt Hydraulic Fluid
See Figure 13-22.
1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)
2. Lower cab completely and allow it to settle into full resting position.
3. Compare actual fluid level (4) to applied level mark (2) on the cab tilt reservoir (1).
4. If necessary, add oil to fill reservoir. (See “Cab Tilt Hydraulic Fluid Filling” on page 13-12.)
TRAINER SEAT

Removal
1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)
2. Fold trainer seat (9) up into storage position.

3. Remove cap screw (1), washers (2), and lock nut (3).
4. Remove cap screw (4), washers (5), lock nut (6), bracket (7), and trainer seat belt (8).
5. Remove cap screws (10), washers (11), lock nuts (12), and trainer seat.
6. Repair or replace components as necessary.

Inspection
- Clean all parts of dirt and debris.
- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.
- Inspect seat belt for damage, frayed belts, or loose latch. Replace parts found to be unserviceable.

Installation
Installation is the reverse of the removal procedure.
Kit Installation


1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

2. Install cap screw (13), washer (14), and seat belt latch (15) to trainer seat (9).

3. Install cap screw (16), washers (17), lock nut (18), bracket (7), and trainer seat belt (8).

4. Remove floor mat to reveal floor cap screw mounting locations (19).

5. Replace floor mat. Drill corresponding holes through the floor mat to access cap screw mounting locations.

6. Install cap screws (10), washers (11), lock nuts (12), and trainer seat.

7. Install cap screw (4), washers (5), lock nut (6), and bracket (7) to trainer seat.
WIPER MOTOR

Removal
See Figures 13-29 and 13-30.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)
2. Lower cab completely and allow it to settle into full resting position.

3. Remove cap screws (1) and wiper motor cover (2).

4. Install identification tags and disconnect electrical connector (3).
5. Remove clips (4) and set arms (5) aside.
6. Remove nuts (6) and wiper motor (7).
7. Repair or replace components as necessary.

Inspection
- Clean all parts of dirt and debris.
- Inspect washer hoses, fittings, and clamps for leaks, holes, cracks, and loose connections. Replace parts found to be unserviceable.
- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.
- Inspect electrical connectors and wiring for damage, corrosion, or loose connections. Replace parts found to be unserviceable.

Installation
Installation is the reverse of the removal procedure.
# Section 14

## COVERS AND GUARDS

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</tr>
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<td>Inspection</td>
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<td>Installation</td>
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</table>
INTRODUCTION

The purpose of the COVERS AND GUARDS section is to provide service and maintenance personnel with guidance on the proper procedures for removing and replacing the various protective covers on the TICO Pro-Spotter terminal trucks.

The TICO Pro-Spotter terminal trucks have been engineered for quick and efficient servicing while minimizing downtime. Removing the covers and guards allows the service and maintenance personnel to gain access to other critical components for service or maintenance.

Service and maintenance personnel should only remove covers deemed necessary for the service or maintenance procedure being performed.

For additional information, please contact TICO factory support. (See “CONTACT TICO SUPPORT” on page 0-15.)
FRONT COVERS AND GUARDS

Removal

See Figures 14-1, 14-2, 14-3, and 14-4.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)
2. Remove screws (1) and front left cover (2).
3. Remove screws (3) and front right cover (4).

4. Using an appropriate lifting device, support front bumper (5).
5. Remove cap screws (6), washers (7), nuts (8), and front bumper.

Figure 14-1: Front Covers and Guards

<p>| | | | | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1</td>
<td>Screw (14 used)</td>
<td>4</td>
<td>Front Right Cover</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>Front Left Cover</td>
<td>5</td>
<td>Bumper</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>Screw (14 used)</td>
<td>6</td>
<td>Cap Screw (12 used)</td>
<td>12</td>
</tr>
<tr>
<td>5</td>
<td>Front Bumper</td>
<td>13</td>
<td>Radiator Guard</td>
<td></td>
</tr>
</tbody>
</table>

CAUTION

Prevent possible crushing injury from heavy component. Use appropriate lifting device.
6. Remove cap screws (9), washers (10), lock nuts (11), and brush guard (12).

7. Using an appropriate lifting device, support radiator guard (13).

8. Remove cap screws (14), washers (15), and nuts (16).

9. With radiator guard still supported, locate the engine block heater connector (if equipped) (17) on back side of radiator guard.

10. Install identification tags, press connector release button (18), and disconnect engine block heater connector (if equipped).

11. Remove radiator guard.

12. Repair or replace components as necessary.

**Inspection**

1. Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.

**Installation**

Installation is the reverse of the removal procedure.
GRATES AND COVERS

Removal
See Figures 14-5, 14-6, 14-7, 14-8, 14-9, and 14-10.

**NOTE**
While the D.O.T. and Off-Road tractor covers are different, the procedures are similar.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)
2. Lower the boom and fifth wheel.

**Figure 14-5: Grates and Covers (off-road tractor shown)**

<p>| | |</p>
<table>
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<tr>
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<tr>
<td>2</td>
<td>Entry Tread Plate</td>
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<td>3</td>
<td>Top Fuel Tank Grate</td>
</tr>
<tr>
<td>4</td>
<td>Bottom Fuel Tank Grate</td>
</tr>
<tr>
<td>5</td>
<td>Cab Step Grate</td>
</tr>
<tr>
<td>6</td>
<td>Transmission Grate</td>
</tr>
<tr>
<td>7</td>
<td>Boom Grate</td>
</tr>
</tbody>
</table>
3. Remove cap screws (8), washers (9), lock nuts (10), and handrail (1).

4. Raise the cab.

5. Remove cap screws (11), washers (14), lock nuts (15), and entry tread plate (2).

6. Remove cap screws (16), washers (17), nuts (18), and cab step grate (5).

7. Remove cap screws (19), washers (20), lock washers (21), nylon washer (22), transmission heat shields (23 and 24), and transmission grate (6).
Figure 14-9: Fuel Tank Grates

8. Remove cap screws (12) and top fuel tank grate (3).
9. Remove cap screws (13) and bottom fuel tank grate (4).

Figure 14-10: Boom Grate

10. Remove cap screws (24), washers (25), boom heat shields (26 and 27), and boom grate (7).
11. Repair or replace components as necessary.

Inspection

1. Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.

Installation

Installation is the reverse of the removal procedure.
LEFT COVERS AND GUARDS

Removal

See Figures 14-11, 14-12, 14-13, 14-14, 14-15, and 14-16.

NOTE
While the D.O.T. and Off-Road tractor covers are different, the procedures are similar.
1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

Figure 14-11: Left Covers and Guards (off-road tractor shown)

1 Left Front Fender 2 Cab Lift Pump Cover 3 Top Fuel Tank Grate 4 Bottom Fuel Tank Grate 5 Diesel Exhaust Fluid (DEF) Cover 6 Rear Fender 7 Mud Flap (2 used)

Figure 14-12: Left Front Fender

NOTE
Figure 14-12 shows the cab lift pump removed for clarity.
2. Remove cap screws (8), washers (9), nuts (10), and front fender bracket (11).

1 Left Front Fender 3 Top Fuel Tank Grate 5 Diesel Exhaust Fluid (DEF) Cover 7 Mud Flap (2 used)
2 Cab Lift Pump Cover 4 Bottom Fuel Tank Grate 6 Rear Fender

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1 TPS-126

11

10 Lock Nut (2 used) 8 Cap Screw (2 used) 9 Washer (4 used) 10 Lock Nut (2 used) 11 Front Fender Bracket
3. Remove cap screws (22), washers (23), and cab lift pump cover (2).

4. Remove cap screws (12) and top fuel tank grate (3).

5. Remove cap screws (13) and bottom fuel tank grate (4).

6. Remove cap screws (14), washers (15), lock nuts (16), and diesel exhaust fluid (DEF) tank cover (5).
**Inspection**

- Clean all parts of dirt and debris.
- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.

**Installation**

Installation is the reverse of the removal procedure.

---

**NOTE**

Rear fender (6), mud flaps (7), and rear fender brackets (21) can be removed as an assembly or individually. This procedure documents removing the assembly.

7. Remove cap screws (17) and nuts (18).
8. Remove rear fender (6), mud flaps (7), and rear fender brackets (21) as an assembly.
9. Repair or replace components as necessary.

---

**Figure 14-16: Rear Fender and Mud Flaps Assembly**
RIGHT COVERS AND GUARDS

Removal
See Figures 14-17, 14-18, 14-19, and 14-20.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

2. Remove cap screws (7), washers (8), lock nuts (9), and front mud flap (6).

NOTE
While the D.O.T. and Off-Road tractor covers are different, the procedures are similar.

Figure 14-17: Right Covers and Guards (off-road tractor shown)

Figure 14-18: Front Mud Flap
CAUTION

Avoid injury and serious burns from hot components. Allow afttreatment covers and heat shields to cool before removing.

3. Remove cap screws (10), washers (11), lock nuts (12), and intermediate aftertreatment cover (4).
4. Remove cap screws (13), washers (14), lock nuts (15), and plate (16).
5. Remove cap screws (17), washers (18), lock washers (19), and lower aftertreatment cover (3).
6. Remove cap screws (20), washers (21), lock nuts (22), and rear heat shield (23).
7. Remove cap screws (24), washers (25), lock nuts (26), and upper aftertreatment cover (5).
8. Remove cap screws (27), washers (28), lock nuts (29), and mud guard (30).
9. Remove cap screws (31), washers (32), lock nuts (33), and front heat shield (34).
### Inspection

1. Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.

### Installation

Installation is the reverse of the removal procedure.

---

**Figure 14-20: Rear Fender and Mud Flaps Assembly**

**NOTE**

Rear fender (2), mud flaps (1), and rear fender brackets (37) can be removed as an assembly or individually. This procedure documents removing the assembly.

10. Remove cap screws (35) and nuts (36).

11. Remove rear fender (2), mud flaps (1), and rear fender brackets (37) as an assembly.

12. Repair or replace components as necessary.
HEATING AND AIR CONDITIONING

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INTRODUCTION

The purpose of the HEATING AND AIR CONDITIONING section is to provide service and maintenance personnel with guidance on the proper procedures for servicing heating and air conditioning systems on the TICO Pro-Spotter terminal trucks.

The TICO Pro-Spotter terminal trucks have been engineered for quick and efficient servicing while minimizing downtime.

Service and maintenance personnel should only open the heating and air conditioning systems if absolutely necessary.

For additional information, please contact TICO factory support. (See “CONTACT TICO SUPPORT” on page 0-15.)

CAUTIONS AND PROPER HANDLING OF R134a REFRIGERANT

---

**CAUTION**

Prevent refrigerant from contacting eyes or skin. Refrigerant will freeze eyes or skin on contact. Wear goggles, gloves, and protective clothing. If refrigerant contacts eyes or skin, do not touch or rub the area. Splash large amounts of cool water on affected area. Seek out medical treatment immediately.

---

**CAUTION**

Do not allow refrigerant to contact open flames or hot surfaces such as electric welding arc, electric heating element, and lighted smoking materials. Do not heat refrigerant over 52°C (125°F) in a closed container. Internal pressure increases when the refrigerant container is heated. The increased pressure can make the container burst. Keep refrigerant containers away from heat sources. Store refrigerant in a cool place.

---

**CAUTION**

Do not handle damp refrigerant container with bare hands. Skin may freeze to container. Wear gloves. If skin freezes to container, pour cool water over container to free the skin. Seek out medical treatment immediately.

---

**IMPORTANT**

R134a refrigerant is used in the air conditioning system in order to meet government standards relating to the use of refrigerants. Because it does not contain chlorine, R134a is not detrimental to the ozone in the atmosphere. However, it is illegal to discharge any refrigerant into the atmosphere. It must be recovered using an appropriate refrigerant recovery, recycling, and recharging station.
R134a REFRIGERANT HOSES AND TUBING

Inspection

**IMPORTANT**

Air conditioning system hoses contain special barriers in the walls which prevent migration of refrigerant gas. Do not use hydraulic hoses as replacement hoses in the air conditioning system.

Whenever a component is disconnected from the air conditioning system, a thorough inspection of hoses and tubing for moisture, grease, dirt, rust, or other foreign material must be completed. If such contamination is present in any hoses, tubing, or fittings and cannot be removed by cleaning, then replace parts.

**IMPORTANT**

Chlorinated solvents (such as trichloroethylene) are contaminants, and must not be used for cleaning. Chlorinated solvents will cause hose deterioration.

Fittings that have grease or dirt on them should be wiped clean with a cloth dampened with alcohol.

Apply a small amount of clean, correct viscosity refrigerant oil on all hose and tube connections to help prevent leaking at joints and connections. Dip O-rings in correct viscosity refrigerant oil before assembling.

R134a REFRIGERANT OIL INFORMATION

Removal

**CAUTION**

Prevent refrigerant from contacting eyes or skin. Refrigerant will freeze eyes or skin on contact. Wear goggles, gloves, and protective clothing.

1. Handle refrigerant safely. (See “R134a REFRIGERANT HOSES AND TUBING” on page 15-4.)
2. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

**CAUTION**

Avoid possible injury. New compressors are charged with a mixture of nitrogen, R134a refrigerant, and R134a refrigerant oil. Wear safety goggles and discharge compressor slowly.

3. Remove and repair or replace air conditioner compressor. (See “AIR CONDITIONER COMPRESSOR” on page 15-10.)
4. If a new compressor is required, drain existing oil into graduated container while rotating compressor shaft.
5. Record measured oil volume and discard oil properly.
6. If oil drained from a compressor that was removed from operation is very black or amount of oil is less than specification, perform the following:

**Specification**

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<tr>
<th>Compressor Oil—Volume</th>
<th>200 mL</th>
</tr>
</thead>
<tbody>
<tr>
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<td>6.8 fl oz</td>
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a. Inspect for R134a leakage. (See “R134a REFRIGERANT LEAK TEST” on page 15-5.)
b. Remove and discard receiver/dryer. (See “RECEIVER/DRYER” on page 15-19.)
c. Determine if a complete system flush is required and flush if necessary. (See “FLUSH AND PURGE AIR CONDITIONING SYSTEM” on page 15-9.)
d. If compressor is serviceable, pour flushing solvent in manifold ports and internally wash out any remaining old oil.
e. Install a new receiver/dryer. (See “RECEIVER/DRYER” on page 15-19.)
Inspection

1. Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.

2. Check condition of air conditioning system lines and tubing. (See “R134a REFRIGERANT HOSES AND TUBING” on page 15-4.)

3. Check components, lines, and fittings for signs of leakage. (See “R134a REFRIGERANT LEAK TEST” on page 15-5.)

Installation

1. Install the compressor. (See “AIR CONDITIONER COMPRESSOR” on page 15-10.)

IMPORTANT

• Prevent possible air conditioning system damage. Do not add any more oil than required or maximum cooling will be reduced.

• Prevent possible air conditioning system contamination. Do not leave system or R134a compressor oil containers open. Refrigerant oil absorbs moisture quickly.

• Prevent possible damage to acrylic or ABS plastic materials. Spilling R134a refrigerant oil on these will cause rapid material deterioration.

• Prevent possible air conditioning system damage. Identify R134a oil containers and measures to eliminate accidental mixing of different oils.

2. Add required amount of R134a compressor oil. If any section of hose is removed and flushed or replaced, measure length of hose and use formula 3 mL per 30 cm (0.1 fl oz per ft) to determine correct amount of oil to be added.

3. Connect all components.

4. Evacuate air conditioning system. (See “Evacuate R134a System” on page 15-7.)

5. Recharge R134a air conditioning system. (See “Recharge R134a System” on page 15-8.)

R134a REFRIGERANT LEAK TEST

Inspection

| CAUTION |
| Prevent refrigerant from contacting eyes or skin. Refrigerant will freeze eyes or skin on contact. Wear goggles, gloves, and protective clothing. |

1. Handle refrigerant safely. (See “R134a REFRIGERANT HOSES AND TUBING” on page 15-4.)

2. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

| CAUTION |
| R134a refrigerant is under high pressure. Only qualified personnel should attempt to service the system. Failure to follow proper service practices may result in injury. Should an accidental system discharge occur, perform the following: |
| • Avoid breathing in the air conditioner refrigerant and lubricant vapor or mist. Exposure may irritate the eyes, nose, and throat. |
| • Ventilate the work area before continuing work. |
| • See additional health and safety information available from the refrigerant and lubricant manufacturers. |

NOTES

• Small amounts of refrigerant oil escape with leaking refrigerant.

• Some refrigerant manufacturers add dye to refrigerant to aid in leak detection.

1. Inspect all lines, fittings, and components for oily or dusty conditions or for traces of refrigerant dye.

2. Spray a solution of soap and water on system components, lines, and connections. Look for bubbles to form as a sign of leakage.

3. If available, use a R134a refrigerant leak detector to slowly go over and around lines and fittings.

Specifications

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<td></td>
<td>6.8 fl oz</td>
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</table>
R134a REFRIGERANT RECOVERY, RECYCLING, AND RECHARGING STATION

Installation

See Figure 15-1.

1. Handle refrigerant safely. (See “R134a REFRIGERANT HOSES AND TUBING” on page 15-4.)
2. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

CAUTION

Avoid possible injury from air conditioning system refrigerant. Do not remove high-pressure relief valve. Air conditioning system will discharge rapidly.

IMPORTANT

Prevent possible air conditioning system damage. Use correct refrigerant recovery, recycling, and recharging stations. Do not mix refrigerant, hoses, fittings, components, or refrigerant oils.

3. Close both high and low-pressure valves on refrigerant recovery, recycling, and recharging station (1).
4. Remove caps from low and high-pressure test ports (2 and 3).
5. Connect blue low-pressure hose (4) from refrigerant recovery, recycling, and recharging station to low-pressure test port.
6. Connect red high-pressure hose (5) to high-pressure test port.
7. Follow manufacturer’s instructions when using refrigerant recovery, recycling, and recharging station.

Prevent refrigerant from contacting eyes or skin. Refrigerant will freeze eyes or skin on contact. Wear goggles, gloves, and protective clothing.

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1 Refrigerant Recovery, Recycling, and Recharging Station
2 Low-Pressure Test Port
3 High-Pressure Test Port
4 Low-Pressure Hose (blue)
5 High-Pressure Hose (red)

Figure 15-1: Refrigerant Recovery, Recycling, and Recharging Station
Recover R134a Refrigerant

1. Handle refrigerant safely. (See “R134a REFRIGERANT HOSES AND TUBING” on page 15-4.)
2. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

Evacuate R134a System

1. Handle refrigerant safely. (See “R134a REFRIGERANT HOSES AND TUBING” on page 15-4.)
2. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

Prevent refrigerant from contacting eyes or skin. Refrigerant will freeze eyes or skin on contact. Wear goggles, gloves, and protective clothing.

CAUTION

Prevent refrigerant from contacting eyes or skin. Refrigerant will freeze eyes or skin on contact. Wear goggles, gloves, and protective clothing.

CAUTION

Prevent possible injury from air conditioning system refrigerant. Do not remove high-pressure relief valve. Air conditioning system will discharge rapidly.

IMPORTANT

Prevent possible air conditioning system damage. Use correct refrigerant recovery, recycling, and recharging stations. Do not mix refrigerant, hoses, fittings, components, or refrigerant oils.

3. Run air conditioning system for 3 minutes to help in recovery process.
4. Turn air conditioning system off before proceeding with recovery steps.
5. With engine OFF, connect refrigerant recovery, recycling, and charging station. (See “R134a REFRIGERANT RECOVERY, RECYCLING, AND RECHARGING STATION” on page 15-6.)
6. Follow manufacturer’s instructions when using refrigerant recovery, recycling, and recharging station.

NOTE

Vacuum specifications listed are for sea level conditions. Subtract 3.4 kPa (34 mbar) (1 in Hg) from 98 kPa (980 mbar) (29 in Hg) for each 300 m (1000 ft) elevation above sea level.

6. Evacuate system until low-pressure gauge registers specified vacuum.
   If specified vacuum cannot be obtained in 15 minutes, a leak may be present. Locate and repair leak. (See “R134a REFRIGERANT LEAK TEST” on page 15-5.)
7. When vacuum reaches specified level, close low side and high side valves. Turn vacuum pump off.

8. If vacuum decreases more than specified amount in 5 minutes, there is a leak in the system.

9. Locate and repair leak. (See “R134a REFRIGERANT LEAK TEST” on page 15-5.)

10. Start evacuation. Open low side and high side valves.

11. Evacuate system for 30 minutes after initial specified vacuum is reached.


13. Charge system. (See “Recharge R134a System” on page 15-8.)

---

### Specifications

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<td>Subtract 3.4 kPa from 98 kPa for each 300 m elevation. Subtract 34 mbar from 980 mbar for each 300 m elevation. Subtract 1 in Hg from 29 in Hg for each 1000 ft elevation.</td>
</tr>
</tbody>
</table>

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### Recharge R134a System

**CAUTION**

Prevent refrigerant from contacting eyes or skin. Refrigerant will freeze eyes or skin on contact. Wear goggles, gloves, and protective clothing.

1. Handle refrigerant safely. (See “R134a REFRIGERANT HOSES AND TUBING” on page 15-4.)

2. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

**CAUTION**

Avoid possible injury from air conditioning system refrigerant. Do not remove high-pressure relief valve. Air conditioning system will discharge rapidly.

### Important

Prevent possible air conditioning system damage. Use correct refrigerant recovery, recycling, and recharging stations. Do not mix refrigerant, hoses, fittings, components, or refrigerant oils.

3. Connect refrigerant recovery, recycling, and recharging station. (See “R134a REFRIGERANT RECOVERY, RECYCLING, AND RECHARGING STATION” on page 15-6.)

4. Evacuate system. (See “Evacuate R134a System” on page 15-7.)

**IMPORTANT**

Before beginning to charge air conditioning system, the following conditions must exist:

- Engine must be stopped.
- Pump must be capable of pulling at least 28.6 in Hg vacuum (sea level).
- Adjust targeted vacuum if elevation is 300 m (1000 ft) or more above sea level, if applicable. Subtract 3.4 kPa (34 mbar) (1 in Hg) from 98 kPa (980 mbar) (29 in Hg) for each 300 m (1000 ft) elevation above sea level.
- Follow manufacturer’s instructions and charge system.
- Add refrigerant until system is charged to specification.

---

### Specification

<table>
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<tr>
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<tr>
<td>Leak Present—Decrease in Vacuum</td>
<td>3.4 kPa 34 mbar 1 in Hg</td>
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</table>
7. Disconnect refrigerant recovery, recycling, and recharging station.
8. Turn on air conditioning system and verify proper operation.

**FLUSH AND PURGE AIR CONDITIONING SYSTEM**

**Procedure Set-Up**

<table>
<thead>
<tr>
<th>CAUTION</th>
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</thead>
<tbody>
<tr>
<td>Prevent refrigerant from contacting eyes or skin. Refrigerant will freeze eyes or skin on contact. Wear goggles, gloves, and protective clothing.</td>
</tr>
</tbody>
</table>

1. Handle refrigerant safely. (See “R134a REFRIGERANT HOSES AND TUBING” on page 15-4.)
2. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avoid possible injury from air conditioning system refrigerant. Do not remove high-pressure relief valve. Air conditioning system will discharge rapidly.</td>
</tr>
</tbody>
</table>

**IMPORTANT**

Prevent possible air conditioning system damage. Use correct refrigerant recovery, recycling, and recharging stations. Do not mix refrigerant, hoses, fittings, components, or refrigerant oils.

3. Connect refrigerant recovery, recycling, and recharging station. (See “R134a REFRIGERANT RECOVERY, RECYCLING, AND RECHARGING STATION” on page 15-6.)

**IMPORTANT**

Air conditioner compressor is serviceable. Do not attempt to flush through receiver/dryer. Flushing solution may not be completely removed from component and could cause system malfunction.

4. Recover refrigerant from system. (See “Recover R134a Refrigerant” on page 15-7.)

**NOTE**

A new receiver/dryer must be installed anytime the air conditioning system is discharged.

5. Remove and discard receiver/dryer. (See “RECEIVER/DRYER” on page 15-19.)

**Air Conditioner Compressor Cleaning**

1. Pour cooling system flushing solvent into the suction and discharge ports. Plug both ports in compressor manifold.
2. Turn compressor end-for-end and roll compressor side-to-side.
3. Remove both plugs from manifold ports and drain flushing solvent from air conditioner compressor.
4. Connect battery power and ground to engage air compressor clutch solenoid. Rotate pulley at least 5 revolutions to move cooling system flushing solvent out of cylinders.
5. Invert air conditioner compressor. Roll end-for-end and side-to-side. Drain thoroughly.
6. Repeat previous two steps at least 3 times.
7. Dispose of cooling system flushing solvent properly.

**Condenser Flush and Purge**

1. Determine if condenser is a continuous loop or parallel flow style.
2. Add cooling system flushing solvent to inlet end of compressor discharge line.
3. Attach a return hose to end of receiver/dryer inlet hose. Place hose into a suitable container to collect cooling system flushing solvent.
4. Using compressed air, force cooling system flushing solvent through condenser circuit. Air pressure must be at least to specification for flushing and purging.

<table>
<thead>
<tr>
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<tr>
<td>Air Pressure Minimum Pressure (for flushing and purging)</td>
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</table>

**NOTES**

- Purging condenser circuit takes 10—12 minutes to thoroughly remove solvent.
- Additional flushing cycles are required if system is heavily contaminated with burned oil or metal particles.
5. Test for cooling system flushing solvent. Hold hose close to a piece of cardboard; continue purging until cardboard is dry.
6. Dispose of cooling system flushing solvent properly.

Evaporator Flush and Purge

1. Add cooling system flushing solvent to inlet end of evaporator inlet line.
2. Attach a return hose to air conditioner compressor inlet hose. Place hose into a suitable container to collect cooling system flushing solvent.
3. Using compressed air, force cooling system flushing solvent through evaporator circuit. Air pressure must be at least to specification for flushing and purging.

NOTES

• Purging evaporator circuit takes 10—12 minutes to thoroughly remove solvent.
• Additional flushing cycles are required if system is heavily contaminated with burned oil or metal particles.
4. Test for cooling system flushing solvent. Hold hose close to a piece of cardboard; continue purging until cardboard is dry.
5. Dispose of cooling system flushing solvent properly.

Procedure Wrap-Up

1. Install a new receiver/dryer. (See “RECEIVER/DRYER” on page 15-19.)
2. Add required oil. (See “R134a REFRIGERANT OIL INFORMATION” on page 15-4.)
3. Install air conditioner compressor. (See “AIR CONDITIONER COMPRESSOR” on page 15-10.)
4. Evacuate the system. (See “Evacuate R134a System” on page 15-7.)
5. Recharge the system. (See “Recharge R134a System” on page 15-8.)
**Inspection**

1. Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.

2. Check condition of air conditioning system lines and tubing. (See “R134a REFRIGERANT HOSES AND TUBING” on page 15-4.)

3. Check components, lines, and fittings for signs of leakage. (See “R134a REFRIGERANT LEAK TEST” on page 15-5.)

**Installation**

Installation is the reverse of the removal procedure.

- If replacing with a new air conditioner compressor, flush and purge each component in the air conditioning system individually. (See “FLUSH AND PURGE AIR CONDITIONING SYSTEM” on page 15-9.)
- Evacuate the system. (See “Evacuate R134a System” on page 15-7.)
- Recharge the system. (See “Recharge R134a System” on page 15-8.)

---

**Figure 15-3: Air Conditioner Compressor**

5. Install identification tags and disconnect electrical connectors (4 and 5).

6. Loosen cap screws (8) and nuts (7).

7. Loosen belt (9).

8. Remove cap screws (6) and air conditioner compressor (3).

9. Repair or replace components as necessary.
BLOWER MOTOR

Removal


1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)

2. Remove front right cover. (See “FRONT COVERS AND GUARDS” on page 14-3.)

3. Loosen nuts (1). Remove plate (2) and fresh air filter (3).

**NOTE**

Cap screws (6) do not need to be removed in order to remove interior covers (7 and 8).

4. Remove cap screws (4 and 5). Remove interior covers (7 and 8) as an assembly.

5. Install identification tags and disconnect electrical connectors (9—12).

6. Install identification tags and disconnect hoses (13—17).

7. Remove cap screws (18) and upper cover (19).

8. Remove cap screws (20) and set valve (21) aside.

9. Remove cap screws (22). Roll blower motor cover (23) assembly to interior.
10. Install identification tags and disconnect electrical connectors (24 and 25).

11. Move blower motor (26) and blower motor cover (23) to interior of cab.

**Inspection**

- Clean all parts of dirt and debris.
- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.

**Installation**

Installation is the reverse of the removal procedure.
CONDENSER

Removal
See Figure 15-10.
1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)
2. Recover existing R134a refrigerant from the system. (See “Recover R134a Refrigerant” on page 15-7.)
3. Remove brush guard. (See “FRONT COVERS AND GUARDS” on page 14-3.)

Inspect all parts of dirt and debris.
Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.
Check condition of air conditioning system lines and tubing. (See “R134a REFRIGERANT HOSES AND TUBING” on page 15-4.)
Check components, lines, and fittings for signs of leakage. (See “R134a REFRIGERANT LEAK TEST” on page 15-5.)

Installation
Installation is the reverse of the removal procedure.
Evacuate the system. (See “Evacuate R134a System” on page 15-7.)
Recharge the system. (See “Recharge R134a System” on page 15-8.)
EVAPORATOR

Removal


1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)
2. Remove front right cover. (See “FRONT COVERS AND GUARDS” on page 14-3.)
3. Recover existing R134a refrigerant from the system. (See “Recover R134a Refrigerant” on page 15-7.)

4. Loosen nuts (1). Remove plate (2) and fresh air filter (3).

**NOTE**

Cap screws (6) do not need to be removed in order to remove interior covers (7 and 8).

5. Remove cap screws (4 and 5). Remove interior covers (7 and 8) as an assembly.

6. Install identification tags and disconnect electrical connectors (9—12).
7. Install identification tags and disconnect hoses (13—17).
8. Remove cap screws (18) and upper cover (19).

9. Remove cap screws (20) and set valve (21) aside.
10. Remove cap screws (22). Roll blower motor cover (23) assembly to interior.

**Figure 15-11: Fresh Air Filter**

**Figure 15-12: Interior Covers**

**Figure 15-13: Blower Motor Cover (front)**
11. Install identification tags and disconnect electrical connectors (24 and 25).

12. Move blower motor (26) and blower motor cover (23) to interior of cab.

13. Remove clamp (27) and freeze probe (28) from within evaporator (29).

14. Remove cap screws (30) and cover plate (31).

15. Remove cap screws (32) and plate (33).

16. Install identification tags and disconnect refrigerant lines (34 and 35). Close all openings using caps and plugs.

17. Remove evaporator.

18. Repair or replace components as necessary.

**Inspection**

- Clean all parts of dirt and debris.
- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.
- Check condition of air conditioning system lines and tubing. (See “R134a REFRIGERANT HOSES AND TUBING” on page 15-4.)
- Check components, lines, and fittings for signs of leakage. (See “R134a REFRIGERANT LEAK TEST” on page 15-5.)

**Installation**

Installation is the reverse of the removal procedure.

- Evacuate the system. (See “Evacuate R134a System” on page 15-7.)
- Recharge the system. (See “Recharge R134a System” on page 15-8.)
HEATER CORE

Removal
1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)
2. Remove front right cover. (See “FRONT COVERS AND GUARDS” on page 14-3.)
3. Recover existing R134a refrigerant from the system. (See “Recover R134a Refrigerant” on page 15-7.)
4. Loosen nuts (1). Remove plate (2) and fresh air filter (3).

NOTE
Cap screws (6) do not need to be removed in order to remove interior covers (7 and 8).

5. Remove cap screws (4 and 5). Remove interior covers (7 and 8) as an assembly.

6. Install identification tags and disconnect electrical connectors (9—12).
7. Install identification tags and disconnect hoses (13—17).
8. Remove cap screws (18) and upper cover (19).
9. Remove cap screws (20) and set valve (21) aside.
10. Remove cap screws (22). Roll blower motor cover (23) assembly to interior.
11. Install identification tags and disconnect electrical connectors (24 and 25).

12. Move blower motor (26) and blower motor cover (23) to interior of cab.

13. Remove clamp (27) and freeze probe (28) from within evaporator (29).

14. Remove cap screws (30) and cover plate (31).

15. Remove cap screws (32) and plate (33).

16. Install identification tags and disconnect coolant lines (34 and 35). Close all openings using caps and plugs.

17. Remove heater core (36).

18. Repair or replace components as necessary.

**Inspection**

- Clean all parts of dirt and debris.
- Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.
- Check condition of cooling system lines and tubing.

**Installation**

Installation is the reverse of the removal procedure.

- Fill cooling system. (See “Cooling System Filling” on page 4-15.)
**RECEIVER/DRYER**

**Removal**

See Figure 15-25.

**NOTE**

* A new receiver/dryer must be installed anytime the air conditioning system is discharged.

1. Park and prepare tractor for service. (See “Park Tractor Safely” on page 1-3.)
2. Tilt the cab.
3. Remove brush guard. (See “FRONT COVERS AND GUARDS” on page 14-3.)
4. Recover existing R134a refrigerant from the system. (See “Recover R134a Refrigerant” on page 15-7.)
5. Install identification tags and disconnect electrical connectors (1 and 5).
6. Disconnect refrigerant lines (3 and 6). Close all openings using caps and plugs.
7. Loosen clamps (4).
8. Remove and discard receiver/dryer (2).
9. Repair or replace components as necessary.

**Inspection**

1. Check all threaded components for damaged or stripped threads. Repair light damage with thread chasers. Replace parts found to be unserviceable.
2. Check condition of air conditioning system lines and tubing. (See “R134a REFRIGERANT HOSES AND TUBING” on page 15-4.)
3. Check components, lines, and fittings for signs of leakage. (See “R134a REFRIGERANT LEAK TEST” on page 15-5.)

**Installation**

Installation is the reverse of the removal procedure.

**NOTE**

* A new receiver/dryer must be installed anytime the air conditioning system is discharged.

- Install a new receiver/dryer.
- Evacuate the system. (See “Evacuate R134a System” on page 15-7.)
- Recharge the system. (See “Recharge R134a System” on page 15-8.)
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